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US ARMY
AVIATION
SYSTEMS COMMAND



**THE ADVANCED DIGITAL-OPTICAL CONTROL SYSTEM (ADOCS)
USER DEMONSTRATION PROGRAM**

Joel L. Terry, Jr., Joseph D. Dickinson, and Major Gary D. Jerauld

September 1989

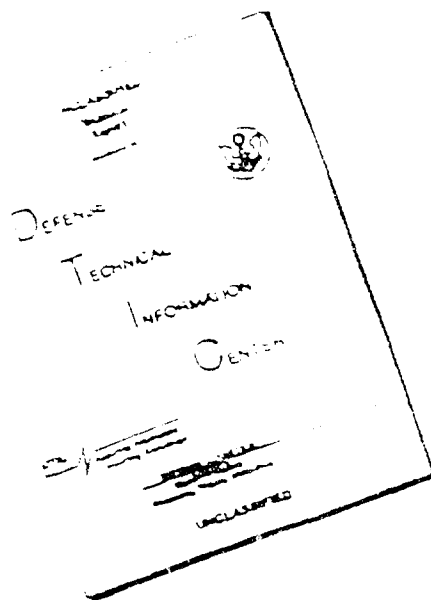
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19. ABSTRACT (Continue on reverse if necessary and identify by block number) This report documents the guest/user pilot assessment of the Advanced Digital-Optical Control System (ADOCS) installed in the JUH-60A "Light Hawk" helicopter. The assessment was performed by 76 guest/user pilots from Government, industry, and the news media. Pilot comments were collected on the performance of the ADOCS fly-by-light control system relative to the Primary Flight Control System (PFCS), the Automatic Flight Control System (AFCS) (Core & Selectable Modes), and the force-type sidearm controllers. Several areas for improvements were identified.					
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PREFACE

The ADOCS User Demonstration Program (UDP) was a joint effort performed by the U.S. Army Aviation Applied Technology Directorate (AATD), Fort Eustis, Virginia, and the Boeing Helicopter Company, Philadelphia, Pennsylvania, under AATD contract DAAK51-82-C-0002. Demonstration flights were conducted from Boeing's Flight Test Center at the Greater Wilmington Airport, New Castle, Delaware. The authors wish to thank the following Boeing ADOCS team members, without whom the program would not have been a success:

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Mr. Nick Albion
Mr. Paul LaSala
Mr. Steve Glusman
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Mr. John Bishop
Mr. Bob Rayburn

Program Manager
Engineering Manager
Project Engineer
Handling Qualities Engineer
DOCS Safety Pilot
DOCS Safety Pilot
Test Director

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INTRODUCTION

The Advanced Digital-Optical Control System (ADOCS) contract, DAAK51-82-C-0002, was awarded by the U.S. Army Aviation Applied Technology Directorate (AATD), Fort Eustis, Virginia, to the Boeing Helicopter Company, Philadelphia, Pennsylvania, in November 1981. The objective of this 8-year, multiphase contract was to demonstrate the feasibility and assess the performance of a digital fly-by-light flight control system that could be used in future Army scout/attack helicopters. The contract was initiated with five work tasks:

- Task I Preliminary Design
- Task II Detail Design and Hardware Fabrication
- Task III Helicopter Modification and System Integration
- Task IV Flight Test and User Demonstration Program
- Task V Production Configuration Definition

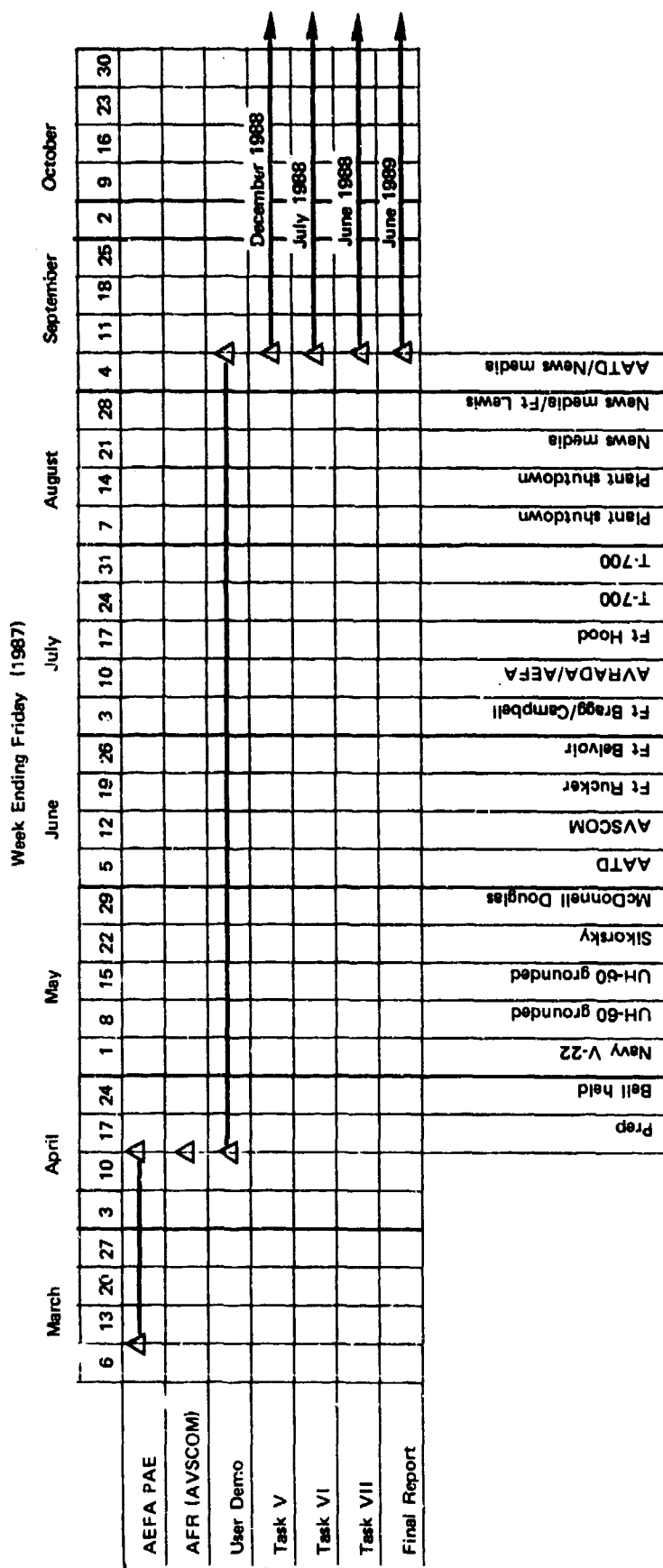
The contract was subsequently modified to include two additional tasks:

- Task VI Autorotational Control Law Development
- Task VII Control Response Documentation

This report documents the results of the User Demonstration Program (UDP) that was performed as part of Task IV during the period of April through September 1987. The UDP involved flight assessment of the ADOCS JUH-60A Light Hawk helicopter (Figure 1) by guest/user pilots from Government, industry, and the news media. The program was conducted over a 14-week period and involved 76 guest pilots flying the Light Hawk for a total of 126 flight-hours. Demonstration flights were conducted from Boeing's Flight Test Center, Wilmington, Delaware, with one off-site deployment to Fort Belvoir, Virginia, for 1 week of demonstration flying by senior aviators from the Pentagon. The UDP schedule is shown in Figure 2.



Figure 1. ADOCS JUH-60A Light Hawk helicopter.



ADOCS DESIGN DESCRIPTION

The ADOCS design concept is shown in Figure 3. Pilot's commands from multi-axis sidarm controllers are measured and transmitted via fiber-optic cables to onboard digital flight control processors. The digital processors perform signal shaping and control mixing on the pilot's commands, and optically signal the rotor actuators to respond accordingly. Aircraft sensor information for stability and control augmentation is obtained by the processor from the optical data bus. The system architecture uses separated primary and automatic control paths.

The Primary Flight Control System (PFCS) is analogous to an unaugmented mechanical control system found on current helicopters. It provides a highly reliable direct link between the pilot and the rotor actuators. The ultimate flight-safety reliability of the aircraft is vested in the PFCS, which is designed with two-fail operational reliability. The Automatic Flight Control System (AFCS) provides stability and control augmentation (SCAS) and mission-related "selectable" functions. Mission reliability is vested in the AFCS, which is designed with single-fail operational reliability.

Modifications made to the demonstrator aircraft to accommodate the ADOCS hardware included changes to the right cockpit station to incorporate the DOCS pilot four-axis controller (FAC), the collective pitch controller (CPC), and the pedal force transducer (PFT). The backup control system (BUCS)/Safety pilot occupies the left cockpit station of the JUH-60A. The BUCS/Safety pilot station retains the mechanical control system used in a production UH-60A. The responsibility of the BUCS/Safety pilot is to follow the controls during all ADOCS developmental flying. He initiates a transfer back to the UH-60A mechanical flight control system and takes control of the aircraft when a DOCS slow-over failure is encountered. In addition, the BUCS/Safety pilot accepts command of the aircraft if an automatic transfer is initiated by the DOCS monitor (Figure 4) which senses rapid hard-over failures. The ADOCS demonstrator installation is shown in Figure 5. An in-depth description of the ADOCS design is contained in the preliminary design specification.*

*Advanced Digital-Optical Control System (ADOCS) Flight Demonstrator Program, Interim Technical Report-Detailed Design, DOC. No. D358-10045-1, Boeing Vertol Company, Philadelphia, Pennsylvania, May 1983.

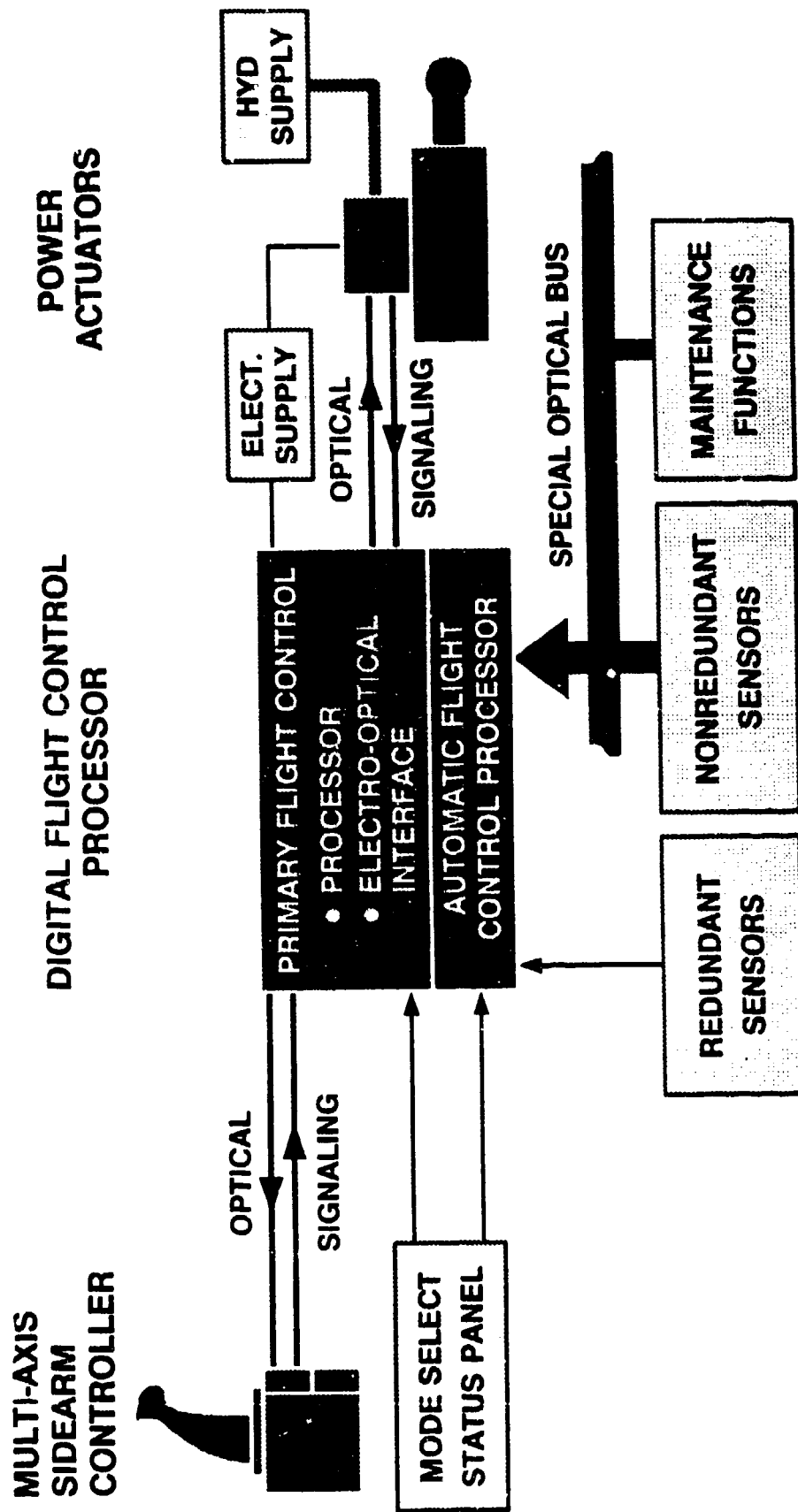


Figure 3. AD0CS design concept.

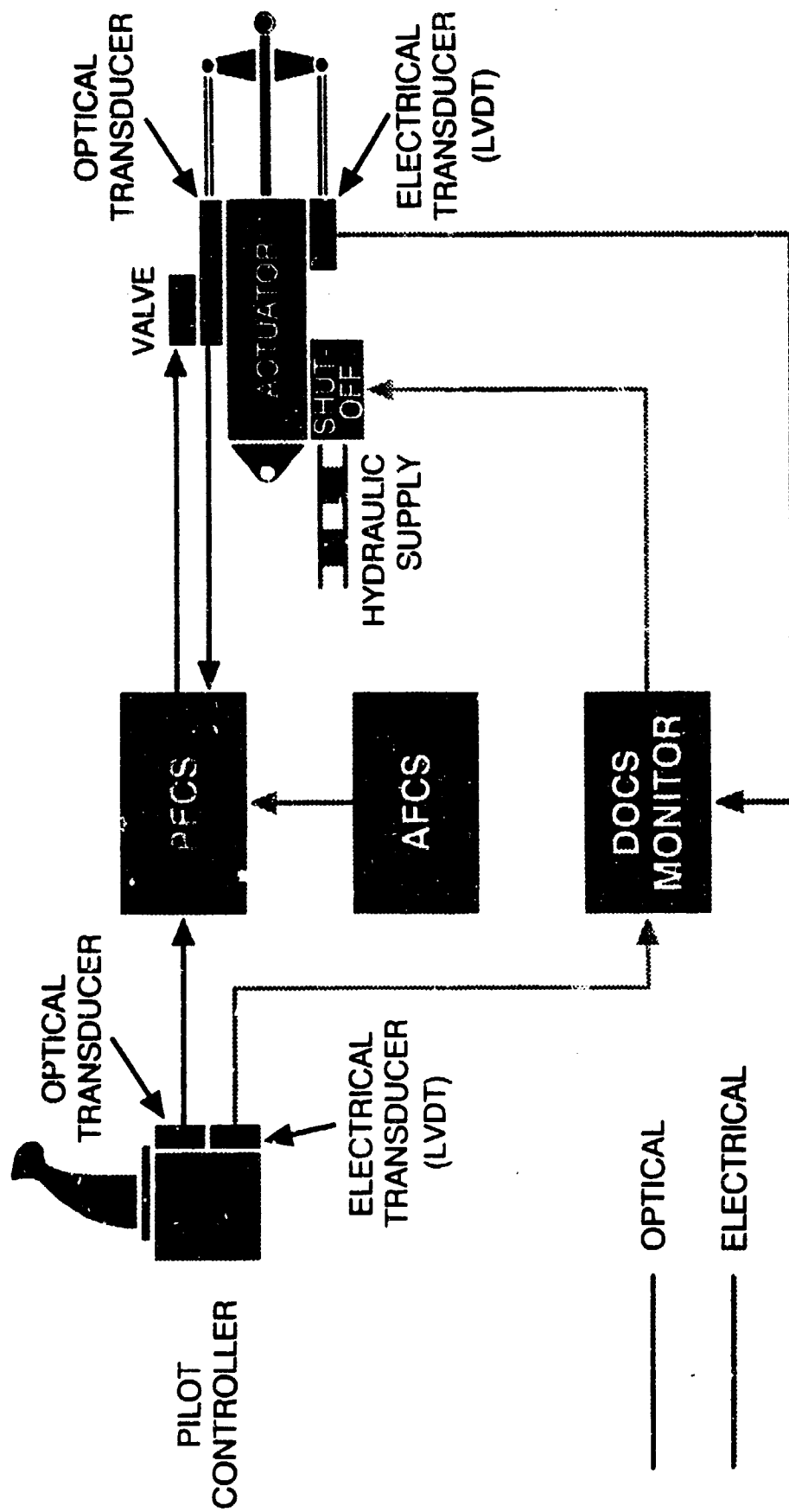
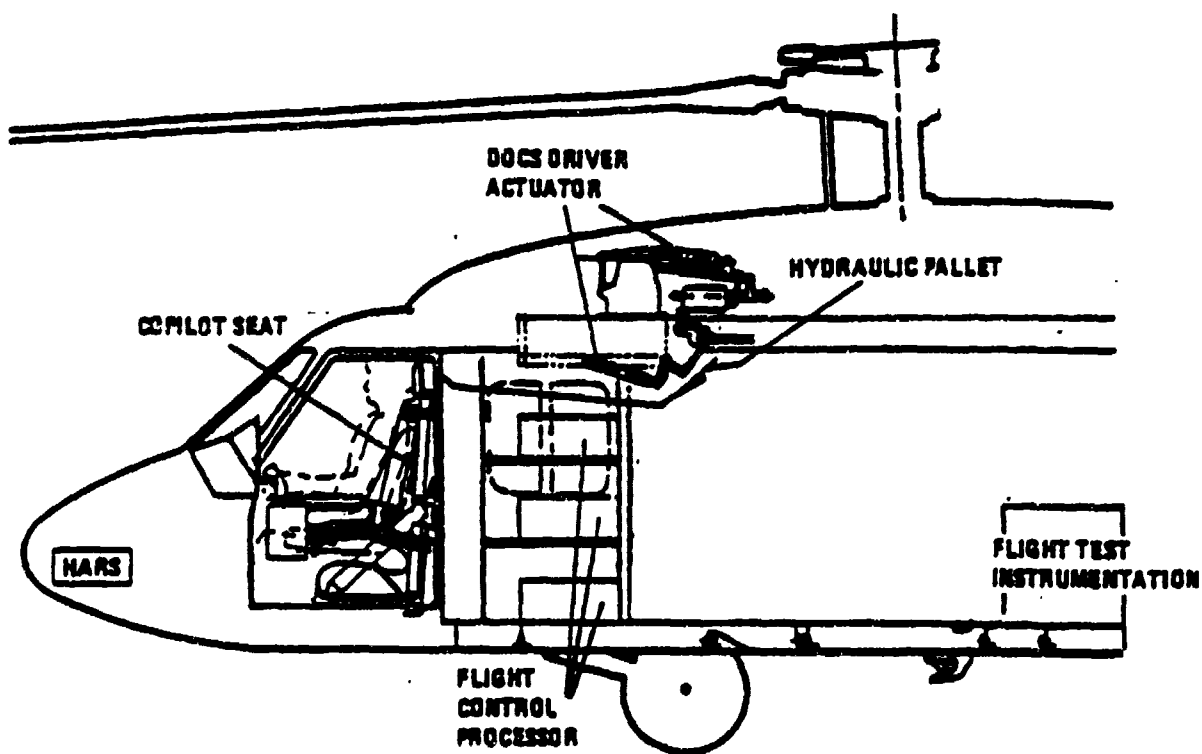
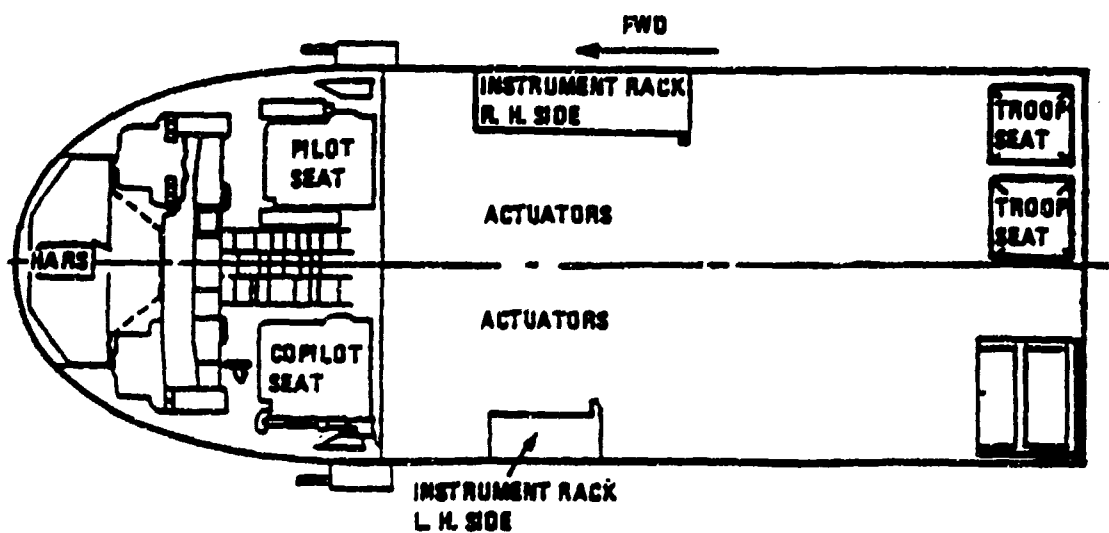


Figure 4. DOCS monitor system.



Demonstrator Inboard Profile



Demonstrator General Floor Layout

Figure 5. Demonstrator installation.

CONDUCT OF PROGRAM

Prior to the first flight for each guest/user pilot, an ADOCS program briefing, systems briefing, and an aircraft operations/safety briefing were presented. A majority of the guest/user pilots flew the aircraft for two 1-hour flights over a two-day period. Some pilots had only enough time for one 1-hour flight. The first flight was structured as a familiarization flight to demonstrate the unique ADOCS features throughout the flight envelope (Table 1). The second flight was structured to demonstrate scout/attack nap of the earth (NOE) mission performance (Table 2). The UDP flight schedule is given in Table 3.

Before the first flight, each pilot filled out a personal history questionnaire as shown in Figure 6. This information was used to establish a background/experience database that could be used during subsequent data analysis to explain any differences in evaluation comments that could be attributed to an experience factor. Pilot's experience ranged from junior officers recently graduated from flight school to senior industry test pilots with over 10,000 flight hours.

Following the last flight, pilots completed a second questionnaire (Figure 7) which provided the outline for their assessment of the ADOCS. Each pilot was asked to compare the ADOCS Automatic Flight Control System (AFCS) and the Primary Flight Control System (PFCS) against the standard UH-60A flight control system, and to make general comments with respect to ride quality, pilot workload, adaptability to sidearm controllers, etc. In all cases, if a pilot was not familiar with a standard system or maneuver with which to compare ADOCS, he was given the opportunity to respond to the question with "cannot judge". One area of the questionnaire requested that the pilots recommend possible changes to improve the ADOCS performance in a future "production-type" system. These recommendations were to be considered for possible incorporation into any follow-on efforts under the ADOCS contract.

The ADOCS JUH-60A Light Hawk was flown by 76 guest/user pilots for a total of 126 flight-hours. The numerical and narrative responses of the pilots are provided in the Appendix. All pilot responses were "digitized" by Boeing and placed in bar-graph form (Figure 8).

NAME: _____ DATE: _____

POSITION/TITLE: _____ PHONE: _____

HOME STATION: _____

TOTAL FLIGHT TIME (APPROX.): _____

ROTARY WING FLIGHT TIME (APPROX.): _____

ROTARY WING EXPERIENCE (LAST 12 MONTHS):

TYPE/MODEL: _____ HOURS: _____

TYPE/MODEL: _____ HOURS: _____

OTHER ROTARY WING AIRCRAFT FLOWN: _____

SIDEARM EXPERIENCE:

TYPE/MODEL: _____ HOURS: _____

TYPE/MODEL: _____ HOURS: _____

NAP-OF-THE-EARTH EXPERIENCE:

TYPE/MODEL: _____ HOURS: _____

TYPE/MODEL: _____ HOURS: _____

SCOUT/ATTACK MISSION EXPERIENCE:

TYPE/MODEL: _____ HOURS: _____

TYPE/MODEL: _____ HOURS: _____

MILITARY EXPERIENCE:

SERVICE: _____ YEARS: _____

PERSONAL DATA:

AGE: _____ HEIGHT: _____ WEIGHT: _____

FLIGHT SUIT SIZE: SMALL _____ MEDIUM _____ LARGE _____

HELMET SIZE: SMALL _____ MEDIUM _____ LARGE _____

GLOVE SIZE: SMALL _____ MEDIUM _____ LARGE _____

HANDEDNESS: RIGHT _____ LEFT _____

ADDITIONAL INFORMATION: _____

Figure 6. ADOCS pilot background questionnaire.

NAME _____

DATE _____

	5 MUCH WORSE	4 WORSE	3 SIMILAR	2 BETTER	1 MUCH BETTER	0 CANNOT JUDGE
ASSESS AFCS PERFORMANCE COMPARED TO						
A) TYPICAL SAS ON HELICOPTER	☐	☐	☐	☐	☐	☐
B) UH-60A SAS ON HELICOPTER	☐	☐	☐	☐	☐	☐
ASSESS PFCS PERFORMANCE COMPARED TO						
A) TYPICAL SAS OFF HELICOPTER	☐	☐	☐	☐	☐	☐
B) UH-60A SAS OFF HELICOPTER	☐	☐	☐	☐	☐	☐

	5 UNACCEPTABLE	4 POOR	3 AVERAGE	2 GOOD	1 EXCELLENT	0 CANNOT JUDGE
ASSESS AFCS PERFORMANCE						
A) ROLL						
1) STABILITY	☐	☐	☐	☐	☐	☐
2) CONTROL RESPONSE	☐	☐	☐	☐	☐	☐
B) PITCH						
1) STABILITY	☐	☐	☐	☐	☐	☐
2) CONTROL RESPONSE	☐	☐	☐	☐	☐	☐
C) YAW						
1) STABILITY	☐	☐	☐	☐	☐	☐
2) CONTROL RESPONSE	☐	☐	☐	☐	☐	☐
D) VERTICAL						
1) STABILITY	☐	☐	☐	☐	☐	☐
2) CONTROL RESPONSE	☐	☐	☐	☐	☐	☐

Figure 7. ADUCS pilot evaluation questionnaire.

WHAT DID YOU LIKE ABOUT THE SYSTEM:

WHAT DID YOU DISLIKE ABOUT THE SYSTEM:

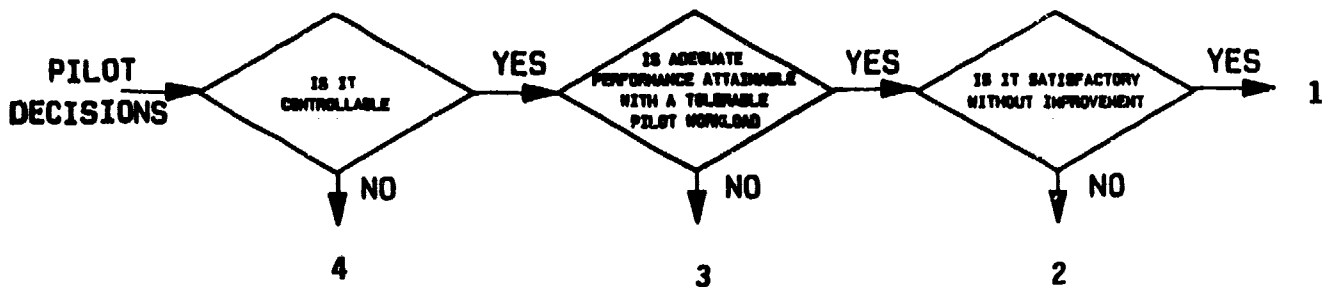
WHAT SYSTEM IMPROVEMENTS WOULD YOU RECOMMEND:

WHAT ADDITIONAL FEATURES WOULD YOU RECOMMEND:

Figure 7. Continued.

HANDLING QUALITIES

ASSESS HANDLING QUALITIES PERFORMANCE



		4	3	2	1	0 (CANNOT JUDGE)
LANDING/TAKEOFF GROUND OPERATIONS (AFCS CORE & HEADING HOLD)	A). GROUND TAXI	☐	☐	☐	☐	☐
	B). VERTICAL T.O./LANDING	☐	☐	☐	☐	☐
	C). SLOPED T.O./LANDING	☐	☐	☐	☐	☐
	D). RUNNING T.O./LANDING	☐	☐	☐	☐	☐
	E). AIR TAXI	☐	☐	☐	☐	☐
HOVER AND LOW SPEED (AFCS CORE & HEADING HOLD &)	A). PRECISION HOVER (ALL MODES)	☐	☐	☐	☐	☐
	B). LATERAL FLIGHT (VELSTAB & RADAR ALT.)	☐	☐	☐	☐	☐
	C). REARWARD FLIGHT (VELSTAB & RADAR ALT.)	☐	☐	☐	☐	☐
	D). MASK/UNMASK (ALL MODES)	☐	☐	☐	☐	☐
	E). HOVER TURN (ALL MODES)	☐	☐	☐	☐	☐
	F). DASH/QUICK STOP (VELSTAB & RADAR ALT.)	☐	☐	☐	☐	☐
	G). NAP-OF-THE-EARTH (MODES AS REQUIRED)	☐	☐	☐	☐	☐

Figure 7. Continued.

HANDLING QUALITIES

ASSESS HANDLING QUALITIES PERFORMANCE

AFCS		4	3	2	1	(CANNOT JUDGE)
FORWARD FLIGHT (AFCS CORE & HEADING HOLD &)	A). TRIMMABILITY	☐	☐	☐	☐	☐
	B). TURNS (BARO)	☐	☐	☐	☐	☐
	C). ACCEL./DECEL. (BARO)	☐	☐	☐	☐	☐
	D). PULL UP/PUSH OVER	☐	☐	☐	☐	☐
	E). AIR TO GROUND TARGETING	☐	☐	☐	☐	☐
	F). AUTOROTATION	☐	☐	☐	☐	☐
	G). STRAIGHT APPROACH	☐	☐	☐	☐	☐
	H). TURNING APPROACH	☐	☐	☐	☐	☐
	I). CLIMBS/DESCENTS (BARO)	☐	☐	☐	☐	☐
PFCS						
A). APPROACH TO HOVER		☐	☐	☐	☐	☐
B). VERTICAL LANDING		☐	☐	☐	☐	☐

COMMENTS:

Figure 7. Continued.

SELECTABLE MODES

ASSESS VALUE OF SELECTABLE MODES

	NO VALUE 5	LITTLE VALUE 4	SOME VALUE 3	HIGH VALUE 2	VERY HIGH VALUE 1	CANNOT JUDGE 0
A). HEADING HOLD	☐	☐	☐	☐	☐	☐
B). VEL. STAB.	☐	☐	☐	☐	☐	☐
C). HOVER ASSIST	☐	☐	☐	☐	☐	☐
D). RAD. ALT. HOLD	☐	☐	☐	☐	☐	☐
E). BARO. ALT. HOLD	☐	☐	☐	☐	☐	☐

COMMENTS:

Figure 7. Continued.

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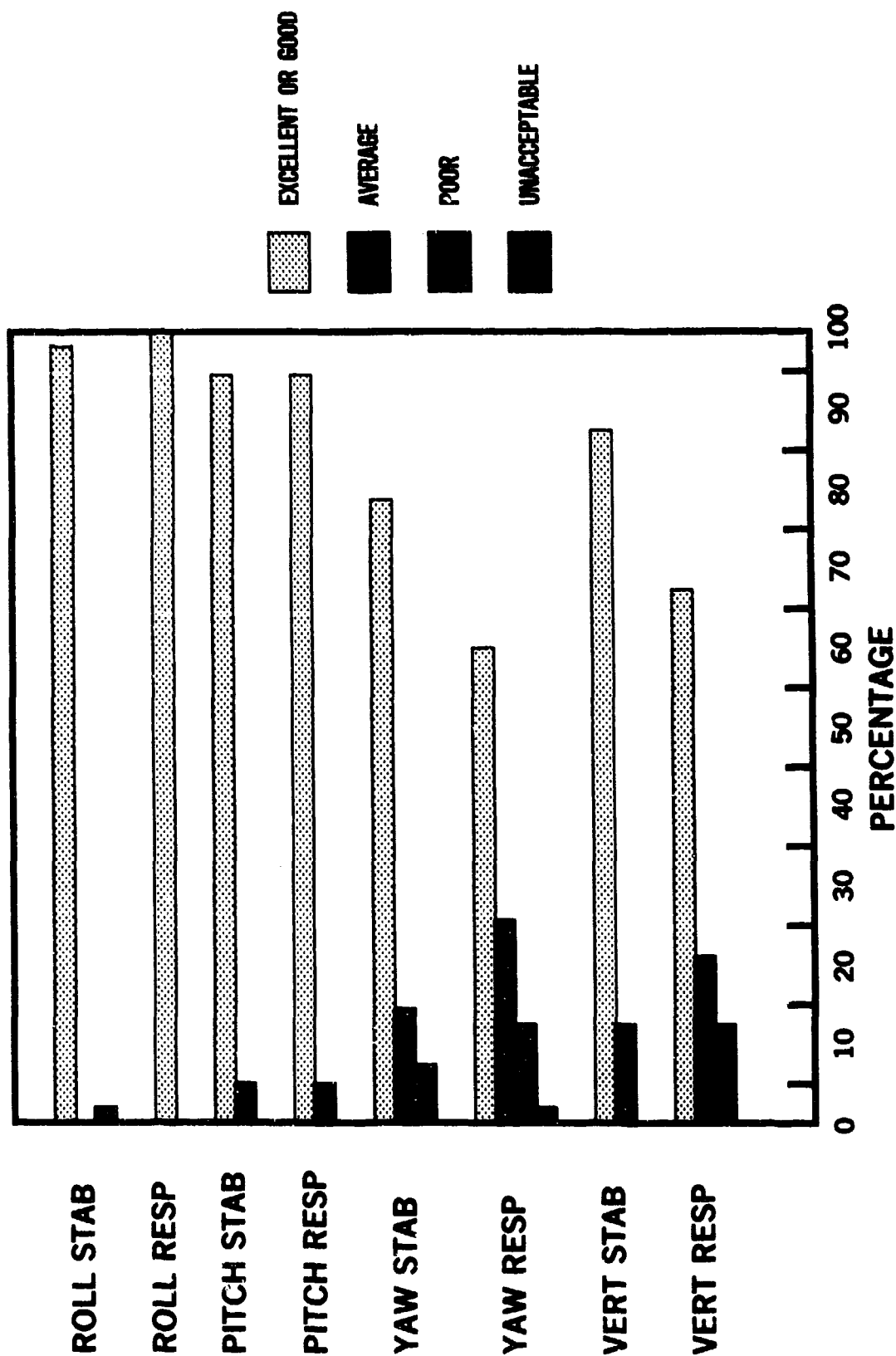


Figure 8. AD0CS pilot response summary.

TABLE 1. DEMONSTRATION FLIGHT 1

Event	Elapsed Time	Army Field Circular 1-212 Task No.	Selectable Modes					
			CORE	HDG HLD	VEL STAB	RAD HOLD	BAR HOLD	HOVER ASSIST
Cruise Flight Engagement (Introduce control axis one at a time)			X	X				
Maneuvering Flight Climbs/Descents Accel/Decel Turns	30 min	1021	X	X			X	
Traffic Pattern		1022,1028	X	X				
Normal Takeoff	40 min	1018	X	X				
Precision Hover (Bring on selectable modes one at a time and repeat pedal turns, sideward & rearward flight)	55 min	1017	X	X	X	X		X
Takeoffs & Landings	1 hr	1032	X	X				
Ground Taxi		1015	X	X				

TABLE 2. DEMONSTRATION FLIGHT 2

Event	Elapsed Time	Army Field Circular 1-212 Task No.	Selectable Modes					
			CORE	HDG HLD	VEL STAB	RAD HOLD	BAR HOLD	HOVER ASSIST
Cruise Flight Engagement (Introduce control axis one at a time)			X	X				
Maneuvering Flight Climbs/Descents Accel/Decel Turns Ground Tracking	20 min	1021	X	X				
NOE Flight (Selectable modes as desired)	30 min	1035, 1037, 1038	X	X				
Instrument Approach	45 min	1081	X	X			X	
Traffic Pattern		1022, 1028	X	X				
Maximum Performance Takeoff	50 min	1019	X	X				
Mask/Unmask (perform several times bringing on selectable modes)	55 min	1090	X	X	X	X		X
Hover OGE		1036	X	X	X	X		X
Takeoffs & Landings	1 hr	1032	X	X				
Ground Taxi		1015	X	X				

TABLE 3. ADOCS USER DEMONSTRATION DAILY SCHEDULE
DATE PREPARED: 9/04/87

	Date	Monday	Tuesday	Wednesday	Thursday	Friday	Date
V22 (Bell)	Apr 20	Maintenance	(R. Balzer)	D. Cannon-BHT T. Warren-BHT D. Cannon-BHT T. Warren-BHT			Apr 24
V22 (Navy)	Apr 27	(R. Mecklin) LTC W. Lawrence-USMC	LTC W. Lawrence-USMC	CPT G. Jerauld-AATD	CMDR R. Venorn-USN MAJ J. Hull-USMC CPT M. Granger-USA	MAJ J. Hull-USMC CPT M. Granger-USA	May 1
SOF Message UH-60-87-06	May 4	SOF Message Received	Grounded	Grounded	Grounded	Grounded	May 8
SOF Message UH-60-87-06 and Check Flights	May 11	Grounded	Sikorsky Inspection SOF Cleared	Vibration Check Flight X-203	DOCS Check Flight Flight X-204		May 15
Sikorsky	May 18	Maintenance	N. Lappos-Sikorsky G. Kohler-Sikorsky	N. Lappos-Sikorsky G. Kohler-Sikorsky	L. Stiles-Sikorsky	L. Stiles-Sikorsky	May 22
McDonnell Douglas	May 25	Holiday	Maintenance	J. Hannan-McD C. Parlier-McD	J. Hannan-McD C. Parlier-McD	J. Hannan-McD C. Parlier-McD	May 29
AATD	Jun 1	Maintenance	LTC B. Lippencott J. Benham	MAJ W. Carmona J. Terry	W/X	CPT G. Pry CW3 B. Buoni J. Macrino	Jun 5
AVSCOM/ARTA	Jun 8	Cpt L. Haworth	LTC A. Weand CPT D. Jenkins	LTC T. Almojuela LTC R. Evans	MAJ J. Drabczuk C. Morse-McD	D. Gabin C. Morse-McD	Jun 12
Rucker	Jun 15	Maintenance	CW3 T. Jones 1LT C. Sherrell	1LT C. Sherrell CW3 T. Jones COL F. Mayer	1LT R. Wright MAJ C. Jones	1LT R. Wright MAJ C. Jones	Jun 19
Belvoir	Jun 22	Weather Deploy to Belvoir	J. Burks-NASA COL M. McGuire COL B. Adams BG D. Funk	A/C Maintenance	Stabilator Installation & Rig	MTF CW4 C. Allen MG A. Cianciolo Return to ILG	Jun 26
Bragg/Campbell	Jun 29	CW4 D. Beishline WO1 C. Kind	CW4 D. Beishline WO1 C. Kind	CW3 R. Heath CW2 J. D'Agostino	CW3 R. Heath CW2 J. D'Agostino	Holiday	Jul 3
AVRADA/AEFA	Jul 6	DAC M. Ehrhart DAC T. Davis	(S. Blushman) CW4 J. Lyle-AEFA	DAC T. Davis CW4 J. Lyle-AEFA	CW4 J. Webre LTC J. Hagen	CW4 J. Webre LTC J. Hagen (J. Lowinger)	Jul 10
Hood	Jul 13	Maintenance	Weather	1LT W. Marchbank CW3 M. Rosas CW4 H. Hutson 1LT B. Barklage	BG(P) R. Andreson 1LT W. Marchbank CW3 M. Rosas	CW4 M. Hutson 1LT B. Barklage	Jul 17
	Jul 20	Maintenance	A/C Maintenance (Engine)	A/C Maintenance (Engine)	A/C Maintenance (Engine)	A/C Maintenance (Engine)	Jul 24
	Jul 27	A/C Maintenance (Engine)	A/C Maintenance (Engine)	A/C Maintenance (Engine)	A/C Maintenance (Engine)	A/C Maintenance (Engine)	Jul 31
	Aug 3	Plant Shutdown	Plant Shutdown	Plant Shutdown	Plant Shutdown	Plant Shutdown	Aug 7

TABLE 3. CONTINUED

	Date	Monday	Tuesday	Wednesday	Thursday	Friday	Date
	Aug 10	Plant Shutdown	Plant Shutdown	Plant Shutdown	Plant Shutdown	Plant Shutdown	Aug 14
Media	Aug 17	A/C Maintenance (Engine)	A/C Maintenance (Engine)	A/C Maintenance (MTF)	D. Nelms (Prof. Pilot)/ (National Def. Mag.) MAJ G. Jerauld-AATD	D. Nelms (Prof. Pilot)/ (National Def. Mag.) (N. Albion)	Aug 21
Media & Lewis	Aug 24	Maintenance (R. Dunn)	D. Green (Rotor & Wing) LCDR Horton (Def. Hel. World) D. Green (Rotor & Wing)	LCDR Horton (Def. Hel. World) (B. Blake)	Weather	CW4 W. Stoneburg WO1 W. Cheek	Aug 28
Media	Aug 31	Maintenance	R. Ropelewski (Avn. Week & Space Tech.) (R. Rayburn)	R. Ropelewski (Avn. Week & Space Tech.) CW4 L. Scott (P. Lasala) (F. Dones)	LTC D. Cahill MAJ T. Kraatz (R. Meuleners) (G. Seehousz)	(J. Davis) (K. Landis) (H. Conover)	Sep 4

CONCLUSIONS

Based on analysis of the guest/user pilot ratings/comments, the following conclusions are offered:

1. The fact that the ADOCS JUH-60A Light Hawk is controlled by a digital fly-by-light control system was transparent to the pilots.
2. The ADOCS force-type sidearm controllers were well received. Adaptation by the pilots was quite rapid.
3. The ADOCS PFCS was as good as a typical unaugmented (SAS OFF) mechanical flight control system.
4. The ADOCS core AFCS provided better response than current operational stability augmentation systems.
5. The ADOCS AFCS provided exceptional aircraft stability (HANDS-OFF hover for 5-10 seconds).
6. Roll stability/response was excellent.
7. Pitch stability/response was good.
8. Yaw stability/response was average.
9. Vertical stability/response was poor.
10. AFCS "Selectable Modes" of Heading Hold, Altitude Hold, Velocity Stabilization, and Hover Assist reduced pilot workload during scout/attack (SCAT) maneuvering.
11. Torque control in the vertical axis was difficult using the force-type (no displacement) sidearm collective due to the absence of a displacement cue that is normally provided by a conventional collective stick.

RECOMMENDATIONS

The following recommendations are offered:

1. Additional developmental flight testing should be conducted to resolve the shortcomings noted by the UDP pilots.
2. A "displacement" collective sidearm controller should be designed, integrated, and flight-tested in an effort to improve vertical axis performance.
3. A UDP should be included as part of all future developmental contracts. The UDP not only transferred the ADOCS technology to the user community but also provided a critical assessment of the ADOCS technology from the unique perspective of pilots who operate in the real-world "field" environment.

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GLOSSARY

AATD	Aviation Applied Technology Directorate
ADOCS	Advanced Digital-Optical Control System
AFCS	Automatic Flight Control System
BUCS	Backup Control System
CPC	Collective Pitch Controller
DOCS	Digital-Optical Control System
FAC	Four-Axis Controller
NOE	Nap-of-the-Earth
PFCS	Primary Flight Control System
PFT	Pedal Force Transducer
SAS	Stability Augmentation System
SCAS	Stability/Control Augmentation System
SCAT	Scout/Attack
UDP	User Demonstration Program

WOODS USER DEMONSTRATION PILOT EVALUATION SUMMARY - INDIVIDUAL RESPONSES

unavailable

[illegible]

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ADCS USER DEMONSTRATION PILOT EVALUATION COMMENTS							
FIRST NAME	LAST NAME	LINES	DISLIKES	IMPROVEMENTS	ADCS FEATURES	NO COMMENTS	MODES COMMENTS
RICHARD	BAUER	LONG/RAT CONTROL EXCELLENT. SOME DIFFICULTY WITH TURN COORDINATION AT LOW SPEED. PREFER SIDE STICK FORCE CONTROL FOR UP AND AWAY PRONERLY FOR TURNABILITY.	THRUST CONTROL INTERGRATION WITHOUT SUFFICIENT CLE.	LOW SPEED TURN COORDINATION, DISPLACEMENT THRUST CONTROL - SHORT TUNEL 4"	WOULD LIKE TO SEE MULTIPLE SWITCHES EVALUATED ON FORCE CONTROLLER TO DETERMINE IF SWITCH OPERATED CONTROL INPUTS IS A PROBLEM. FROM THIS EVALUATION, THE DEVELOPMENT OF A DESIGN CRITERIA FOR FORCE CONTROLLER SWITCHES.		
DOMINIC A.	CANNON	PILOT "OUT OF THE LOOP" SYSTEM WORKED VERY WELL.	FORCE CONTROLLERS - NO TACTILE FEEDBACK (RESULTANT OUTPUT FROM A CALCULATED INPUT. 3-1 IS MUCH LESS PREFERRED vs 2-1-1 CONTROL SYSTEM (DISPLACEMENT).	1. APPLY ADCS CONCEPT TO A DISPLACEMENT SYSTEM ON THE A/C OF YOUR CHOICE (NOTHING MAGIC ABOUT THE UH-60). 2. INCORPORATE A 2-1-1 SIMULTANEOUSLY. 3. DEVELOP SYSTEM SO AS TO UTILIZE THE WHOLE FLIGHT ENVELOPE TO INCLUDE TOLDOLOM AUTOMATIONS AND USUAL STRUCTURAL TYPE CONTROL APPLICATIONS.	IN TURNING MANEUVERS RATING OVER GRASS/NATURAL TERRAIN WAS NOT HOLD SHOULD BE OPTIMIZED.		
T.L.	WARREN	BANK ANGLE HOLD, HOLD FUNCTIONS	CONTROLLER CONFIGURATION 3-1, FORCE CONTROLLERS - HIGH FORCES AND NOT ENOUGH DISPLACEMENT, ATTITUDE CONTROL LANS.	DATE COMMAND ATTITUDE HOLD, DISPLACEMENT CONTROLLERS IN ALL AXES 4-2 (CYCLIC), AUTOMATIC INCORPORATION OF ALL HOLD FUNCTIONS, DISPLACEMENT COLLECTIVE WITH MINIMUM 4" DISPLACEMENT.	START OVER AND INCORPORATE THE ABOVE RECOMMENDATIONS. TECHNOLOGY SHOULD BE USED TO MAKE AN AIRCRAFT EASIER TO FLY - NOT USED AS A WAY TO INCORPORATE TECHNOLOGY.	BANK & HOLD EXCELLENT, PEDAL COORDINATION TO HEADING HOLD THERE IS NO REAL PILOT VALUE TO A FLY BY LIGHT SYSTEM. SELECTABLE MODES NOT QUITE AS IMPORTANT FOR UTILITY MISSIONS. MAKING A HELICOPTER FLY BETTER THAN A PUSH-PULL TUBE CONTROL SYSTEM IS THE PILOT VALUE OF ELECTRONIC FLIGHT CONTROLS.	
WILLIAM S.	LAURENCE	"TASK EASERS" ALT HOLD (LOOKS MUCH BETTER THAN NEXT). HEADING HOLD & VELSTING MAKE LOW SPEED TASKS EASIER. BANK ANGLE MAINTENANCE & A/S HOLD IN UP AND AWAY FLIGHT NICE.	FORCE COLLECTIVE - UNPREDICTABLE, LEADS TO UNWANTED AND/OR INCORRECT MAGNITUDE OF INPUTS. DID NOT LIKE DIRECTIONAL SENSITIVITY PRIMARILY TO A LESSER EXTENT. PITCH AND ROLL LEADS TO DIFFICULTY IN AGGRESSIVE OR HIGH GAIN TASKS. DON'T LIKE THRUST LEVER CONTROL IMPLEMENTATION, AUTOSWITCH TRIPS, POOR TORQUE DISPLAY & TRIM FOLLOW UP INTERACTION, INCONVERTENT YAW ACTIVATION IN TURNS.	DISPLACEMENT COLLECTIVE, LESS SENSITIVE DIRECTIONAL AXIS.	BETTER MORE PREDICTABLE CLE INDICATING SYSTEM.	MY FEELING IS THAT TASKS THAT CAN TAKE ADVANTAGE OR ASSIST FUNCTIONS ARE "W"; THOSE WHICH ARE SUBJECT TO CRITICAL SENSITIVITIES ARE ALL "W" - FAIRLY BASIC.	
ROGER	VENON	LIVE ROLL & PITCH RESPONSIVENESS, HEADING HOLD, ALT. HOLD, ROWER ASSIST, TURN COORDINATION, AIRSPEED REFERENCE SYSTEM, ROWER STABILITY.	RECOMMEND HIGHER YAW BRESOUT FORCE AND DISPLACEMENT THRUST CONTROL.				
GARY R.	KOHLER	HANDLING QUALITIES IN GENERAL ARE GOOD. ROWER ASSIST MODE VERY WELL DONE. ALT HOLD MODES ARE GOOD	WOULD RECOMMEND YAW CHANNELS STABILIZER INCLUDED IN SYSTEM. GRADUANTS + DAMPING. COLLECTIVE POSITION FURTHER AFT AND EITHER LESS				

ADCS USER DEMONSTRATION PILOT EVALUATION COMMENTS									
FIRST NAME	LAST NAME	LINES	DISLIKES	IMPROVEMENTS	ADDED FEATURES	NO COMMENTS	MODES COMMENTS		
NICHOLAS	LAPPOS		TO CONTROL REMOTING DURING BLANKING LANDINGS.	COMPLIANCE IN A FORCE STICK OR A SLIDER. IMPROVE GUST RESPONSE - NOW NO BETTER THAN REGULAR UR-60. SEE ATTACHMENT TO QUESTIONNAIRE.	SEE ATTACHMENT TO QUESTIONNAIRE.		FLY MODE VFR - PYCS WOULD BE LEVEL 1.		
WATT	GRANDER		ROLL RESPONSIVENESS AND STABILITY WAS EXCELLENT. WINGS-OFF ABILITIES BOTH IN FLIGHT AND DURING POWER WITH POWER HOLD ENHANCED WERE EXCEPTIONAL. REDUCED PILOT FLIGHT CONTROL WORKLOAD WOULD HAVE SUFFICIENT TACTICAL ADVANTAGES IN ALLOWING PILOT CONCENTRATION TO BE DEVOTED TO MISSION TASKS.	THE FORCE RATE COLLECTIVE CONTROL REQUIRED CONSTANT REFERENCE IN FLIGHT TO TORQUE / ASI INSTRUMENTS FOR FEEDBACK CUES. VISUAL CUES DURING MOVEMENT FLIGHT WERE THE SYSTEM MORE TOLERABLE IN THESE FLIGHT MODES. HOWEVER I FEEL A TACTICAL ADVANTAGE IN ALLOWING PILOT CONCENTRATION DISPLACEMENT TYPE COLLECTIVE CONTROL WOULD STILL BE A BETTER OVERALL CHOICE.	MAKE THE COLLECTIVE A DISPLACEMENT TYPE CONTROL. REDUCE SENSITIVITY OF THE YAW CONTROL. INITIAL BREAKOUT FORCE IS TOO LARGE IN COMPARISON TO THE GAIN FOR YAW RATE CONTROL. BREAK-OUT FORCE IS PROBABLY ABOUT RIGHT TO PREVENT IMMEDIATE YAW INPUTS DURING ROLL COMMANDS. ANSWER IS TO ADJUST THE GAIN CURVE FOR YAW INPUTS.	FOR A PRODUCTION SYSTEM I WOULD RECONSIDER MOVING THE AFCS ENGAGE FEATURE TO A PANEL NEAR / AS PART OF THE SIDEARM CONTROLLER.			
JEFF	MULL		LINED POSITION COMFORT, RESPONSIVENESS (PITCH & ROLL), EASE OF ADAPTING FROM CONVENTIONAL HELICOPTER CONTROLS.	TOO SENSITIVE IN YAW. RATE COLLECTIVE DIFFICULT TO ADJUST POWER INPUTS/SETTINGS. DISPLACEMENT COLLECTIVE.	SHEEPSKIN SEATSH		SELECTABLE MODES GREATLY REDUCE PILOT WORKLOADS AND ARE APPLICABLE TO MANY FLIGHT TASKS (HIGH POWER WORKLOAD, DIST. FLIGHT, ECT.)		
LORREN	STILES		GOOD JOB WITH AFCS. LINE ADVANCED MODES. LIKE PYCS/AFCS CONCEPT. THE SYSTEM IS CONFIGURED VERY WELL FOR ADDITIONAL ADVANCED FLIGHT CONTROL STUDIES. ALOT OF QUESTIONS STILL NEED TO BE ANSWERED.	DID NOT LIKE FORCE COLLECTIVE. LACK OF HIGH FIDELITY YAW FEEDBACK (COORDINATED TURN IN FLIGHT), GRIP SHAPE AND SIZE.	INVESTIGATE: SUSTAINABILITY OF AUSPRED HOLD VS ATTITUDE HOLD, ATTITUDE VS RATE COMMAND IN PITCH, NEED FOR POSITIVE INFLUENCE STABILITY, HEAD-UP SYMBOLLOGY FOR SCD/ATTACK MISSION / ADDED TRACKING TASKS, METHOD OF COLLECTING PILOT PERFORMANCE DATA OVER MEASURED COURSE (X,Y,Z ACCURACY), GIVEN 4- ING OR FLIR AIRCRAFT SHOULD BE EVALUATED AT NIGHT. DISPLACEMENT COLLECTIVE, MODE PYCS.		ALL TASKS RATED "PO" WOULD HAVE PROBABLY BEEN "PO" IF YAW CONTROL WAS LESS SENSITIVE. OCCASIONAL DIFFICULTY WITH FINAL POWER REDUCTION AFTER TAIL WHEEL TOUCHDOWN. TENDING TO FLY IT AS DISPLACEMENT CONTROL RATHER THAN FORCE CONTROL. I THINK I WOULD HAVE BEEN MORE SUCCESSFUL IF IT HAD BEEN DISPLACEMENT CONTROL.		
CAP	PARLIER		SMOOTH INPUT/RESPONSE EXCEPT YAW. LOW WORKLOAD.	DIDN'T LIKE DROPOUTS, WHEEL WALK ON LANDING, LACK OF PRECISE FLIGHT STATUS DATA.	ADD FOR FLIGHT SYMBOLLOGY, BETTER DEFINITION OF THE OPERATING MODES PREFERABLY				

FIRST NAME	LAST NAME	LIKES	DISLIKES	IMPROVEMENTS	ADDED FEATURES	NO COMMENTS	MOSES COMMENTS
JOH E.	HARRIS	THE ABILITY TO GET THE SYSTEM TO DO WHAT YOU WANT, WHEN YOU WANT IT - WITH LOW PILOT WORKLOAD. EASE OF TAKEOFF. MOVER PERFORMANCE WITH HOLDING & ALT. HOLD ON MOVER ASSIST. (ie. HANDS OFF UP/DOWN, HIGH WORK LOADS DURING LANDINGS/SLOPED).	COMPLEXITY OF SYSTEM - SHOULD BE MORE AUTOMATIC, TRIPS OF SYSTEM DUE TO HIGH RATES AWAY INSURANCE, THE GROUND CONTROL LANS PERFORMANCE, COLLECTIVE INFORMATION PAD/AFT vs UP/DOWN, HIGH WORK LOADS DURING LANDINGS/SLOPED).	REDUCE THE COMPLEXITY OF SYSTEM, MANUAL MODES, SYSTEM DROPOUTS. IMPROVE YAW PERFORMANCE AND TURN COORDINATION, TO MATCH ROLL PERFORMANCE. INCORPORATE TORQUE LIMITING BY SYSTEM AND IMPROVED POWER MANAGEMENT. ADD HELMET DISPLAY TO KEEP HEAD OUT OF COCKPIT. IMPROVE GROUND CONTROL LANS & INCREASE AUGMENTATION FOR THE LANDING TRANSITIONS. ROTATE COLLECTIVE TO MORE VERTICAL UP AND DOWN ACTION.	COUPLED INSTRUMENT APPROACH DAY AND APPRECIATED THE INFORMAL AND OPEN DISCUSSIONS FOLLOWING EACH FLIGHT. KEEP UP THE GOOD WORK. OVERALL THIS COMPANY HAS DONE A FANTASTIC JOB ON THIS SYSTEM AND MORE WORK NEEDS TO BE DONE AND ALOT OF PR AND DEMONSTRATION HAS TO BE DONE. GOOD LUCK.	VERY GOOD BRIEFING ON FIRST DAY AND APPRECIATED THE INFORMAL AND OPEN DISCUSSIONS FOLLOWING EACH FLIGHT. KEEP UP THE GOOD WORK. OVERALL THIS COMPANY HAS DONE A FANTASTIC JOB ON THIS SYSTEM AND MORE WORK NEEDS TO BE DONE AND ALOT OF PR AND DEMONSTRATION HAS TO BE DONE. GOOD LUCK.	AS MY QUESTIONNAIRE THESE ARE JUST OVERALL COMMENTS AND CAN GO ONE BLOCK EITHER WAY DEPENDING ON THE CONSTRAINTS OF THE EVALUATIONS.
BARRY	LIPPENCOIT	CONTROL RESPONSE WAS MUCH BETTER THAN I ANTICIPATED. THE ROLL AXIS + PITCH AXIS IMPRESSED ME. THE YAW AXIS WAS EASIER TO CONTROL THAN I EXPECTED.	DURING DESCENT, THE PRESSURE TO HOLD THE COLLECTIVE DOWN WAS BOTHERSOME.	POSSIBLY A RELEASE/SET BUTTON SIMILAR TO FORCE TRIM ON A UN-1, TO ASSIST IN HOLDING FORWARD PRESSURE ON COLLECTIVE DURING DESCENT.	LANDINGS WERE DONE SEVERAL TIMES PER ATTEMPT, BUT WITH LITTLE TIME FOR NON-UNGO PILOTS IT CAN BE OVERDONE.	THE SIDEARM CONTROLLERS WERE EASIER TO ADAPT TO THAN I FELT THEY WOULD. I WAS SURPRISED AT HOW EASY IT WAS TO CONTROL THE A/C IN ALL FLIGHT ATTITUDES WITH THE SIDEARM CONTROLLERS. THE TRANSITION WAS RELATIVELY SIMPLE. NEED TO TRY TO GET A LOT MORE'S GROUND UP WITH VIDEO CAMS TO FLY THE A/C FOR A COUPLE HOURS TO SEE HOW ADAPTABLE HE IS TO THE SYSTEM AND WHAT HIS LEARNING CURVE IS.	ALL OF THE SELECTABLE MODES ARE NICE TO HAVE. THE HOLDING HOLD, AND ALT & BMOO ALT WOULD BE THE ONES I PRIMARILY WOULD LIKE. YEL STAB & MOVER ASSIST ARE NICE TO HAVE ITEMS.
JOHN	BENHAM	THE CURRENT SIDEARM MANAGEMENT WAS VERY COMFORTABLE AND EASY TO GET USED TO. I FEEL THAT AS EXPERIENCE WAS GAINED CONTROL TOUCH WOULD INCREASE SIGNIFICANTLY.	DID NOT LIKE THE PRESSURES WHEN INCREASING/DECREASING COLLECTIVE WHILE ON BMOO HOLD, THE DIVERGENCY WHEN DOING ROLLING MOVES LAR WITH ONLY PFC'S ON. ALL THOUGH CONTROLLABLE IT WOULD INCREASE PILOT WORKLOAD CONSIDERABLY DURING MANEUVERING FLIGHT. DID NOT LIKE THE AMOUNT OF YAW THAT HAD TO BE HELD IN DURING GROUND TAXING - COULD	SOME SORT OF FEEDBACK IN COLLECTIVE TO GIVE BETTER JUDGMENT DURING HEADS UP MANEUVERING.	UPWARDING DOPPLER & GIVE BETTER MOVER ASSIST (OPTIMIZE DRAFT).		

FIRST NAME	LAST NAME	LINES	DISLIKES	IMPROVEMENTS	ADDED FEATURES	NO COMMENTS	NOTES COMMENTS
JOE	TERRY	ALL SELECTABLE MODES WORKED WELL AS ADVERTISED EXCEPT DIDN'T GET TO TRY HMD ALT HOLD. BANK ANGLE HOLD WITH TURN COORDINATION EXCELLENT.	MODE VERY TIRING. NO STRONG DISLIKES. YAW SENSITIVITY COULD BE LESS FOR FIRST TIME PILOTS BUT NOT NEARLY BAD.	OTHER THAN KNOW TURN RATE OR SOME OTHER CONTROL LAGS SHOULD BE DEVELOPED TO EASE GROUND TAXI.			POWER ASSIST WAS OF SOME VALUE BUT THE SLOW DRIFT TO THE RIGHT WOULD REQUIRE CONSTANT VIGILANCE REPEATING THE PRIMARY ADVANTAGE OF HAVING IT.
GERALD R.	PRY	VERY MUCH LIKED THE ROLL AXIS CONTROLLABILITY AND STABILITY, THE AIRSPEED & HEADING HOLD. ALL OF THESE AREAS FELT NATURAL AND IT WAS EASY TO APPRECIATE THE DECREASED WORKLOAD.	THE YAW AND LONGITUDINAL PITCH INPUTS REQUIRED SOME CONCENTRATION BECAUSE I FOUND MYSELF FIGHTING THE SYSTEM.	A PROPORTIONAL GRADIENT IN THE VERTICAL/POWER AXIS WOULD HELP WITH FEEL. I PULLED IN OR TOOK OUT MORE POWER THAN WAS REQUIRED UNTIL I CONCENTRATED ON FINGER TIP PRESSURE.			
BONI M.	BLOOM	REDUCTION OF PILOT WORKLOAD WITH ALL SYSTEMS OPERATIONAL.	YAW POWER CONTROLLER ENGAGE & DISENGAGE BETWEEN APFS & PILOT INPUT. WHEN ALT HOLD IS DISENGAGED AND AIRSPEED IS INCREASED.	MODIFY RIGHT ANGLEST TO COLLECTIVE INPUT/POWER CONTROL SHOULD BE COUPLED TO ALLOW IT TO ADJUST YOUR ARM A HEAD-UP DISPLAY SO THAT AND HMD POSITION FOR THE YOU DO NOT HAVE TO LOOK BACK YAW CONTROLLER/INTERCOON IN THE COCKPIT FOR INDICATION.			
WALLACE D.	JENKINS	VERY GOOD STABILITY IN PITCH, ROLL, POWER HOLD AND VELOCITY STABILITY MADE IT EASIER (LESS PILOT WORK LOAD) THAN UN-GUN.	CONTROLS (COLLECTIVE) ARE EXTREMELY SENSITIVE. DIFFICULT TO GRAB THE AMOUNT OF FORCE REQUIRED TO GET DESIRED INPUT. TRANSITION FROM FORWARD FLIGHT TO POWER WOULD TAKE SOME PRACTICE. CONSTANT COLLECTIVE AXIS CONTROLLER PRESSURE FOR DESCENT SEEMED TO BE JUST OPPOSITE OF THE GOALS/COMFORTABILITY OF THE SYSTEM (ALT HOLD ON). NOISE UP/DOWN INPUTS IN STABILIZED TURN SEEMED TO DRIVE A/C OUT OF TURN.	POSSIBLY SOME SORT OF LIMIT ON CONTROL MOVEMENT (FORCE REQUIRED).			
ARNOLD E.	LEAND	OVERALL HELICOPTER ATTITUDE MUCH MORE STABLE. TRANSITIONS TO VARIOUS ROLL ATTITUDES WAS CRISP AND POSITIVE. SYSTEM WAS STABLE IN ROLL RATES AND TURN RATES PRECISE. EASY TO BECOME COMFORTABLE WITH SYSTEM.	FLIGHT TO POWER WOULD TAKE SOME PRACTICE. CONSTANT COLLECTIVE AXIS CONTROLLER PRESSURE FOR DESCENT SEEMED TO BE JUST OPPOSITE OF THE GOALS/COMFORTABILITY OF THE SYSTEM (ALT HOLD ON). NOISE UP/DOWN INPUTS IN STABILIZED TURN SEEMED TO DRIVE A/C OUT OF TURN.	EASIER ACHIEVEMENT OF STEADY STATE CLIMBS/DESCENTS WITH ALT HOLD ON. EXPAND SYSTEM TO 3-AXIS AUTO PILOT TYPE CAPABILITIES.			
ROBERT E.	EWMS	EVERYTHING, ESP. WORKLOAD REDUCTION.	WE DO NOT HAVE IT YET ON OPERATIONAL A/C!	YAW RESPONSE SEEMED SMOOTHER TO THE RIGHT THAN TO THE LEFT.	INTERCOON SWITCH ON RIGHT-HAND CONTROLLER SHOULD BE ON BOTTOM OF SWITCH INSTEAD OF TOP, RELEASE OF NUMBER OF OPTIONS A PILOT WAS - ie. TOO MANY CHOICES.		ADD VIA. NEED 2-3 HOURS OF FLIGHT FOR BETTER EVALUATION. BRIEFING WAS SIMPLY SUPER - FOR BOTH TECHNICAL AND OPERATIONAL UNDERSTANDINGS.
THOMAS N.	ALMQUEJA	AFTER GETTING SOMEWHAT FAMILIAR WITH THE SYSTEM I WAS ABLE TO SIGNIFICANTLY RELAX ON THE CONTROLS AND WORKLOAD SIGNIFICANTLY DECREASED DEPENDING ON MODES SELECTED. ESPECIALLY EVIDENT IN POWER ASSIST MODE.	IT WAS PROBABLY DUE TO MY OWN CONTROL INPUT BUT I FELT THE SENSITIVITY IN YAW WAS MORE NOTICEABLE AS COMPARED TO PITCH AND ROLL. VERY NOTICEABLE AT POWER AND AT CRUISE. HOWEVER WITH MORE TIME I'M SURE I COULD MAKE THE CONTROL INPUT A LOT CYCLIC.	SINCE THIS WAS MY FIRST TIME WITH THE SYSTEM, I'M NOT SURE I COULD RECOMMEND ANY IMPROVEMENTS. WRITE A SLIGHT DECREASE IN THE SENSITIVITY IN YAW. PROBABLY RELATES TO TRANSITIONING YAW CONTROL FROM THE FOOT PEDALS TO THE CYCLIC.	TERREBLES IMPROVEMENT OVERALL - ESP. IN COCKPIT WORKLOAD REDUCTION THATS CRUCIAL FOR ICE REQUIREMENTS.		ONCE YOU REALIZE WHAT THE SYSTEM WOULD DO FOR YOU, I FOUND PILOT WORKLOAD SIGNIFICANTLY REDUCED.

ADDS USER DEMONSTRATION
PILOT EVALUATION COMMENTS

FIRST NAME	LAST NAME	LINES	DISLIKES	IMPROVEMENTS	ADDED FEATURES	NO COMMENTS	MODES COMMENTS		
CHAM	MOORE	VERY EASY TO FLY, PARTICULARLY SMOOTH WALL AFCS MODES ENGAGED. TRANSITIONS SMOOTH WITH EXCEPTION OF YAW IN SOME CONDITIONS.	SHOOTER. HIGH BUTTON WORKLOAD, YAW KICKS W/SMALL CONTROL INPUTS & CONTROL REVERSALS, LACK OF COORDINATION WORK. MORE TURN COORDINATION BELOW 40 KTS AND THE ABILITY TRANSITION FROM LATERAL CONTROL = TURN RATE TO LATERAL CONTROL = BANK ANGLE PATH ANGLE. W/O YAW RATE.	MODE AUTOMATIC MODE TRANSITIONS. YAW & TURN COORDINATION WORK. MORE FEEDBACKS IN VERTICAL, CONSIDER: VERTICAL VELOCITY HOLD & ALT CAPTURE < 120, VERTICAL VELOCITY OR FLIGHT PATH ANGLE.	TURN COORDINATION AT LOW SPEED. MORE 4-0 WORK.		COMMENT HERE MADE IN DEBRIEF W/ J. STIMP, H. ALSTON, G. JEROLD.		
TERRY L.	JONES	MOVER ASSIST WOULD BE A REAL AID DURING EXTERNAL LOW/NEEDLE HOIST OPERATIONS. HARD ALT HOLD IS EXCELLENT FOR INSTRUMENT FLIGHT. HEADING HOLD WITH THIS SYSTEM IS FAR SUPERIOR TO CURRENT LH-60 SYSTEM. SYSTEM ENABLES YOU TO GREATLY REDUCE PILOT WORKLOAD. HAVING NOT FLOWN A LH-60 PRIOR TO TEST FLIGHT, RETENTION BETWEEN FIRST AND SECOND FLIGHT WAS VERY GOOD. ALLOWED QUICK LEARNING CURVE IN ADAPTING TO THE SYSTEM AND AIRCRAFT. MUCH GREATER CONTROLLABILITY AND HANDLING RESPONSE. SELECTABLE MODES GREATLY ENHANCE PILOT CONTROL AND TECHNIQUE IN BOTH UTILITY AND SOUL/ATTACK MODES.		THE VERTICAL AXIS CONTROL (COLLECTIVE) AS DESIGNED, REQUIRES PILOT TO DIVIDE HIS ATTENTION IN AND OUT OF THE COCKPIT DUE TO THE LACK OF REAL FEEL OF APPLIED PITCH IN THE SYSTEM) TO AVOID OVER-TORQUE OF THE ENGINE. MORE RESEARCH AND IMPROVEMENT IN YAW CONTROL TO ALLOW FOR GREATER CONTROL IN QUICK POWER CHANGES DURING HIGH SPEED MANEUVERING. ADDITIONAL WORK TO POSSIBLY CHANGE PEDALS TO RIGHT SIDE OF AIRCRAFT TO ANOTHER MODE IF YAW CONTROL IS CONTROLLED THROUGH RIGHT STICK.	A FORCE GRADIENT OF SOME SORT IN THE VERTICAL AXIS.				
CHANDLER C	SHERRELL					VERY IMPRESSED WITH ALL AFCS FUNCTIONS. ADDITIONAL FEATURES WOULD GREATLY ENHANCE MOE AND TERRAIN FLIGHT MODES BY ADAPTING FORWARD LOOKING ALTITUDE HOLD. LOW LEVEL FLIGHT COULD BE GREATLY IMPROVED. CURRENT PILOT WORKLOAD IS GREATLY REDUCED WITH AFCS BUT ADDITIONAL CAPABILITIES WOULD GREATLY ENHANCE PILOT CAPABILITIES.	DID NOT PERFORM PRCS NOR AIR MOVER ASSIST WOULD GREATLY ENHANCE TARGET ACQUISITION TO GROUND TARGETING. ALSO DID NOT PERFORM SLOPE OVERWATCH AND OTHER ASPECTS. LANDINGS. COMMENTS ON MOE PERFORMANCE STATED EARLIER.		
LOAN A.	MAJORTH						ALTITUDE HOLD AND POWER INCREASES DURING MANEUVERS, AND YAW COORDINATION HIGHEST PROBLEM. HOWEVER REALIZE MY YOUR LEVEL IN YOUR SYSTEM.	VERY GOOD JOB OF IMPLEMENTING MODES. THANKS FOR TIME AND LETS TRADE IDEAS IN THE FUTURE. SEE YOU AT WES SOMETIME. CALL ME IF YOU HAVE SUGGESTION ON AUTO MODES, AUTO SELECT, SO ON. ALSO LETS TALK ABOUT THE WAITING IF YOU HAVE QUESTIONS.	

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ADCS USER DEMONSTRATION
PILOT EVALUATION COMMENTS

FIRST NAME	LAST NAME	LINES	DISLIKES	IMPROVEMENTS	ADDED FEATURES	NO COMMENTS	MODES COMMENTS
JAN	DANIELZIK	A/C RESPONSIVENESS IN THE PITCH AND ROLL AXES. MODE FLYING THE A/C EASY WHEN PERFORMING ROLL REVERSALS AND QUICK A/C AIRBORNE FLIGHT TASKS. PILOT WORKLOAD BOTH IN ROLL AND FORWARD FLIGHT WAS REDUCED THROUGH THE USE OF THE SIDEARM CONTROLLER AND THE A/C'S.	ROLLER CLER. CONSTANT PRESSURE AGAINST CONTROLLER (VERTICAL) FOR CLIMBS OR DESCENTS WITH ALT HOLD ENGAGED.	FURTHER RESEARCH IS NEEDED TO OPTIMIZE THE FORCE/DISPLACEMENT TRIMMER IN THE VERTICAL CONTROLLER TO ACCOMMODATE FLIGHT MISSION TASKS. YAW CONTROL SENSITIVITY ALSO NEEDS TO BE REDUCED FOR COORDINATED FLIGHT ABOVE 40 KTS.	MORE AUTOMATIC CONTROL OF INTERACT BETWEEN VARIOUS FLIGHT MODES (RIDER AND FORWARD FLIGHT CONTROL SENSITIVITIES AUTOMATICALLY CONTROLLED TO PROVIDE AN EASIER PILOT TRANSITION BETWEEN MODES). HANDS ON SELECT OF MANUAL FLIGHT MODES WITH THE CAPABILITY TO DESELECT AUTOMATIC FEATURES. NICE TO HAVE AN AUTO ROB-UP FEATURE.	I FEEL ALL THE ABOVE TASKS COULD BE DONE LEVEL 1. HANDLING QUALITIES IF THE SENSITIVITY OF THE YAW AND VERTICAL AXES WAS OPTIMIZED.	THE A/C CONTROLLABLE AND SOVEREIGN EASY TO FLY WITH ALL OF THE MODES DESELECTED. USING THE MODES DEFINITELY DECREASES PILOT WORKLOAD BOTH AT A ROLLER AND IN FORWARD FLIGHT.
CHARLES T.	JONES JR.	EASY TO ADJUST TO THE A/C CONTROLLERS. SIGNIFICANTLY REDUCES PILOT WORKLOAD IN ALL OPERATIONS AND PROVIDES EASIER ACCESS TO INSTRUMENT PANEL BOTH VISUALLY AND PHYSICALLY.	THE VERTICAL AXIS HAS NO FEEDBACK AND IS VERY DIFFICULT TO DETERMINE POWER POSITIONS. THE YAW AXIS CONTROLLER REQUIRES MORE FORCE TO MOVE FROM TRIMMED POSITION AND APPEARS TO MAKE MUCH FASTER RATE THAN PITCH/ROLL.	PROVIDE FEEDBACK IN THE VERTICAL AXIS. IMPROVE YAW POWER FORCES AND REDUCE YAW SENSITIVITY. IMPROVE YAW STABILITY IN FLIGHT MANEUVERS.	DEEP TRIM WOULD REDUCE PILOT WORKLOAD IN INTERMEDIATE ROLL AND IMPROVE AIRBORNE ACCURACY IN FLIGHT. DEEP TRIM IN THE VERTICAL AXIS WOULD IMPROVE THE TRANSIENTS DURING MOVING, AIR TAXI, GROUND TAXI, WITH THE LACK OF VERTICAL FEEDBACK. WITH PROPER VERTICAL AXIS FEEDBACK, MAY NOT BE SIGNIFICANT IMPROVEMENT.	YAW AXIS NEEDS TO BE IMPROVED IN SENSITIVITY AND FORCES REQUIRED TO CORRECT. PITCH AND ROLL MORE CLOSELY REPRESENTATIVE IN YAW. PYS FLIGHT AS GOOD AS SAS/ACOST OFF.	ROLLER ASSIST NEEDS MUCH IMPROVEMENT TO ABSOLUTELY PROVIDE OPERATIONS IN CLOSE TERMINAL/DE OPERATIONS. DRIFT STABILITY MUST BE MORE ACCURATE AND FEEDBACK IN THE VERTICAL AXIS IMPROVED BEFORE ROLLER ASSIST WILL BECOME SIGNIFICANT IMPROVEMENT FOR CLOSE IN TERRAIN OBSTACLE WORK.
ROBERT S.	WRIGHT	GRANTLY REDUCES PILOT WORKLOAD ONCE SYSTEM IS LEARNED. SIDEARM CONTROL ALLOWS A LARGE AREA TO PERFORM ADDITIONAL TASKS. THE FEATURE I LIKED MOST WAS HOW EASY IT WAS TO ADAPT TO THE SYSTEM.	IT IS DIFFICULT TO MAKE LEFT I WOULD & RIGHT WIND PEDAL TURNS AT A ROLLER WITHOUT IMMEDIATELY MAKING LATERAL AND LONGITUDINAL INPUTS.	TURN COORDINATION IN FORWARD FLIGHT NOT GOOD. UNABLE TO PRECISELY TRIM TO PREDETERMINED PARAMETER (A/S, TORQUE, R/C, ECT.). YAW CONTROL RESPONSE TOO SENSITIVE, TOO EASY TO COUPLE WITH PITCH & ROLL. NO YAW CONTROL OR GIVE IT BACK POSITIVE FEEDBACK FOR COLLECTIVE CONTROL IN FORWARD FLIGHT. POSITION/USE OF RADIO/ICS SWITCHES ON CYCLIC/RMG CAUSES CONTROL	GIVE THE FEET SOMETHING TO DO! RADIO/ICS SWITCHES (CONVENIENTLY LOCATED AND DESIGNED) OR MODE SWITCHING FOR A MULTIFUNCTION DISPLAY, IFF SOUNK TOGGLE, ECT. ADD A CROSS HAIR INSTRUMENT SHOWING EQUIVALENT STICK POSITION FROM CENTER FOR REFERENCE/FEEDBACK. USE SPACE BETWEEN LEGS & LOWER TOP OF GLAZE SHIELD FOR BETTER VISIBILITY.	DIFFICULT TO TRIM TO PRECISE PARAMETERS SUCH AS A/S DOPPLER-/AND ALT MODES ARE USED BECAUSE THERE IS NO POSITIVE FEEDBACK - CONTROLS WORK IN COMBAT DUE TO RF FOR RESIDE TRAINING, A/C'S NEEDS FINE TRIM MODE.	
JOHN S.	BLURS	ROLL CONTROL IN FORWARD FLIGHT EXCELLENT. HEADING HOLD IN ALL MODES. SELECTABLE MODES (CAN YOU USE THEM IN COMBAT MEANS ? - DOPPLER INDICATION).	TURN COORDINATION IN FORWARD FLIGHT NOT GOOD. UNABLE TO PRECISELY TRIM TO PREDETERMINED PARAMETER (A/S, TORQUE, R/C, ECT.). YAW CONTROL RESPONSE TOO SENSITIVE, TOO EASY TO COUPLE WITH PITCH & ROLL. NO YAW CONTROL OR GIVE IT BACK POSITIVE FEEDBACK FOR COLLECTIVE CONTROL IN FORWARD FLIGHT. POSITION/USE OF RADIO/ICS SWITCHES ON CYCLIC/RMG CAUSES CONTROL	TURN COORDINATION IN FORWARD FLIGHT NOT GOOD. UNABLE TO PRECISELY TRIM TO PREDETERMINED PARAMETER (A/S, TORQUE, R/C, ECT.). YAW CONTROL RESPONSE TOO SENSITIVE, TOO EASY TO COUPLE WITH PITCH & ROLL. NO YAW CONTROL OR GIVE IT BACK POSITIVE FEEDBACK FOR COLLECTIVE CONTROL IN FORWARD FLIGHT. POSITION/USE OF RADIO/ICS SWITCHES ON CYCLIC/RMG CAUSES CONTROL	GIVE THE FEET SOMETHING TO DO! RADIO/ICS SWITCHES (CONVENIENTLY LOCATED AND DESIGNED) OR MODE SWITCHING FOR A MULTIFUNCTION DISPLAY, IFF SOUNK TOGGLE, ECT. ADD A CROSS HAIR INSTRUMENT SHOWING EQUIVALENT STICK POSITION FROM CENTER FOR REFERENCE/FEEDBACK. USE SPACE BETWEEN LEGS & LOWER TOP OF GLAZE SHIELD FOR BETTER VISIBILITY.	DIFFICULT TO TRIM TO PRECISE PARAMETERS SUCH AS A/S DOPPLER-/AND ALT MODES ARE USED BECAUSE THERE IS NO POSITIVE FEEDBACK - CONTROLS WORK IN COMBAT DUE TO RF FOR RESIDE TRAINING, A/C'S NEEDS FINE TRIM MODE.	

ADCS USER DEMONSTRATION
PILOT EVALUATION COMMENTS

FIRST NAME	LAST NAME	LIKES	DISLIKES	IMPROVEMENTS	ADDED FEATURES	NO COMMENTS	MODES COMMENTS
DAVID	RUNK	EMI/ERP PROTECTION. SNAWS WEIGHT.	INPUTS/COUPLING. DIFFICULTY IN WORKING CONTROLS TO TAKE. NOTHING	RADIO/ICS SWITCHES ON FLOOR OR REPOSITION THEM ON HAND GRIPS. MODE FEEL, A BIT LESS SENSITIVITY.	MODE	COLLECTIVE SENSITIVITY ON APPROACHES SEEMS TO BE A PROBLEM.	SIGNIFICANTLY REDUCES PILOT WORK LOAD.
DAVID	REISLINE	VERY STABLE. SIDE CONTROLS VERY EASY TO FLY VERY PREFERABLE TO CONVENTIONAL HELICOPTER CONTROL IN THE 3-1 MODE.	YAW CONTROL LESS THAN OPTIMIZED.	LATERAL ACCELEROMETERS TO IMPROVE YAW.	NEEDS DISPLACEMENT CUES TO GIVE PILOT FEEDBACK AS TO LIMITS OF MOTOR SYSTEM. MODE ACCURATE STITCH THAN DOPPLER TO ELIMINATE DRIFT IN HOVER MODE.		VEL STAB, HOVER ASSIST, AND HOV. ALT. VERY HELPFUL IN HOV FLIGHT REDUCES PILOT WORKLOAD.
CHARLES	KIND	THE RESPONSE OF THE A/C IN ROLL AND PITCH AXES WERE EXTREMELY QUICK AND SMOOTH. THE CHANGES IN A/S AND VERTICAL SPEED WERE EASY TO CHANGE AND MAINTAIN. WITH VEL STAB, HOVER AND HOV ALT. MODES ON THE PILOT WORK LOAD WAS NEAR NIL, FREEING ME UP.	IT SEEMED LIKE THE TRUST MOTION ON THE YAW CONTROL WAS HARD TO GET USED TO. EVERYTIME I MADE A YAW INPUT WITH THIS RESPONSIVE OF A STITCH, I HAD A TENDENCY TO INCLUDE A LATERAL INPUT. WAS DIFFICULT TO GET A PURE YAW WITHOUT SOME VISUAL STICK DISPLACEMENT ESPECIALLY WITH JUST PFC'S, TENDED TO OVER CONTROL IT.	SOME TYPE OF CHECK OR CROSS CHECK BETWEEN THE COLLECTIVE MOVEMENTS AND MOTOR RPM. EVERYTIME I MADE A YAW INPUT WITH THIS RESPONSIVE OF A STITCH, I HAD A TENDENCY TO INCLUDE A LATERAL INPUT. WAS EASIER. ALSO SOME VISUAL BEAMS OF STICK DISPLACEMENT. SOMETHING TO TUNE VEL STAB INTO RESIDES DOPPLER TO MINIMIZE DRIFT.	ADJUSTABLE HEIGHT AND WIDTH REST. SOME TYPE OF FORWARD LOCKING ALTIMETER SO COULD HAVE TENDENCY FOLLOWING ON HOV. ALT.		THESE MODES WOULD ESPECIALLY BE IDEAL FOR SOLUT/ATTACK MISSIONS, REDUCING PILOTS WORK TO NEAR NOTHING. EXCELLENT!
JOHN A.	WICKLUND	HEADING HOLD FEATURE. LONGITUDINAL RESPONSE AND A/S HOLD.	APPARENT DISSIMILARITY IN ROLL FLY THROUGH VEL STAB THEN AND YAW RESPONSE, MAY BE DUE TO LACK OF ADCS FLIGHT TIME.	YAW RATE RESPONSE (SEE DISLIKES).		NOT ENOUGH EXPOSURE TO FLIGHT EVALUATE TO MORE CONSTRUCTIVE COMMENTS.	
MATTHEW M.	MCQUIRE	STABILITY, OVERALL RESPONSIVENESS AND WORK LOAD SEEMED THAT PART OF THE REDUCTION. WITH THE EXCEPTION OF THE COLLECTIVE, THE 3-AXIS CYCLIC ALLOWS FOR RAPID HABIT TRANSFER.	YAW INPUT RESPONSE. IT SEEMED THAT PART OF THE INPUT WAS MULLED OUT. ADDING MORE INPUT THAN NEEDED TO COMPENSATE OFTEN RESULTING IN RAPID RESPONSE WITH ALL INPUT FORMER (MULLED) AND LATTER PROVIDED COLLECTIVELY.				
R.	HEATH	THE OVERALL STABILITY OF THE UH-60 WITH THE ADCS IS GREATLY IMPROVED. THE ADCS DYNAMIC STABILITY WILL GREATLY ENHANCE THE INC AND MISSION PROFILE OF THE AIRCRAFT.	THE FORCE CONTROL DOES NOT ALLOW THE PILOT TO DISPLACEMENT WOULD PROVIDE FOR A "POWER FEEL". THE PILOT SHOULD BE ABLE TO CONCENTRATE OUTSIDE THE AIRCRAFT. THE FORCE CONTROL COLLECTIVE DOES NOT ALLOW THIS. DENSITIZING THE YAW CONTROL WOULD ENHANCE GROUND HANDLING QUALITIES.	SOME SORT OF COLLECTIVE DISPLACEMENT WOULD PROVIDE FOR A "POWER FEEL". THE PILOT SHOULD BE ABLE TO CONCENTRATE OUTSIDE THE AIRCRAFT. THE FORCE CONTROL COLLECTIVE DOES NOT ALLOW THIS. DENSITIZING THE YAW CONTROL WOULD ENHANCE GROUND HANDLING QUALITIES.	HEAD HOLD ON GROUND. BE ABLE TO SELECT GROUND SPEED OR AIR SPEED FOR THE VEL STAB FUNCTION. FIND A MORE SIMPLE RUN-UP PROCEDURE. BE ABLE TO ADJUST THE ARM CONTROLLERS IN ADDITION TO THE SEAT ADJUSTMENT.		
JAMES R.	D'AGOSTINO	THERE WAS EXCELLENT CONTROL RESPONSE IN ALL AXES. IT WAS HARD TO MAINTAIN A CONSTANT SMOOTH RATE OF TURN IN THE	SLOPES WERE DIFFICULT WITHOUT A REAL "FEEL" FOR THE CONTROLS. SHALLOW SLOPES WERE NOT BAD BUT A STEEP	I WOULD ASK FOR A NON-TRIM HOVER (A CONTINUOUS CONTROL HANDS ON HOVER) IN CYCLIC CONTROL (NO DETENT) TO	MODE THE POSITION OF THE ICS SWITCH ON THE CYCLIC. IT IS DIFFICULT WHEN MAKING A LATERAL OR LONGITUDINAL		

ADCS USER DEMONSTRATION PILOT EVALUATION COMMENTS					
FIRST NAME	LAST NAME	LIKES	DISLIKES	IMPROVEMENTS	ADCS FEATURES
MARK	ERDMAN	YAW AXIS, WITHOUT BEING JERKY AT A HOWER.	SLOPE WOULD BE TRICKY.	PROVIDE FOR CONTINUOUS FEEL OF THE A/C WITH SOME KIND OF SWITCHING TRANSIENT SO INTUALLY. IN FORWARD FLIGHT TRIM (DETENT) WOULD AUTOMATICALLY BE PHASED IN. AND FOR THOSE TIMES WHEN YOU WOULD NEED OR DESIRE TRIM (DETENT) AT A HOWER, THE PILOT WOULD BE ABLE TO MANUALLY ENGAGE IT, ON THE HSP.	NO COMMENTS
		ONCE A MODE IS SELECTED (ie. SIDEARM/SYSTEM SENSITIVITY HOWER W/ AND ALT) A/C IS STABLE ENOUGH TO ALLOW PILOT TO PERFORM OTHER "IN COORDINATE" TASKS. SIDEARM CONTROLLER TO ME IS ACCEPTABLE AND I THINK I COULD ADJUST IN A FEW HOURS.	SENSE/SENSITIVITY HOWER W/ AND ALT) A/C IS CAUSE PROBLEMS ESPECIALLY IN A "TIGHT" (ie. HOSTILE) ENVIRONMENT. ROLL/YAW CROSS CONTROL IN UP AND DOWN TURNS. DEPENDENCE ON ENGINE TURNS FOR FEEL OF PITCH POSITION.	A "DEGREE OF PITCH" INDICATOR TO SHOW MOTOR POSITION INDEPENDENT OF ENGINE TORQUE. SIDEARM CONTROLLER TO PROVIDE LFSS CROSS CONTROL. MODE FLIGHT TEST TO INCLUDE SLING LOAD, CLIMB, ETC. SYSTEM PROTECTION FOR DC/AC TRANSIENTS.	EXCELLENT REAL WORLD STABILITY IN ALL PHASES OF FLIGHT.
TOM	DAVIS	A/C CONTROL CHARACTERISTICS WERE, OVERALL EXCELLENT. APCS WAS VERY IMPRESSIVE. WAS SURPRISED THAT LEARNING CURVE WAS SO QUICK ON LEARNING SYSTEM OPERATION AND HANDLING QUALITIES.	YAW CONTROL WAS A SLIGHT PROBLEM SOMETIMES. NO TENDENCY TO PUT A/C OUT OF TRIM ON STEEP TURNS AND OVER CONTROL DURING LANDINGS ON FIRST FLIGHT. CHANGING GAIN OR ADDITIONAL TRAINING ON SYSTEM MAYBE ALL THAT IS NEEDED.	WOULD LIKE TO FLY A/C WITH EXTERNAL LOG. SYSTEM NEEDS COLLECTIVE STICK POSITION INDICATOR.	COLLECTIVE STICK INDICATOR NEEDED FOR SOME MODES.
JOE	LYLE	VERY GOOD STABILIZATION. EASY TO ADAPT TO. GOOD CONTROL RESPONSE. PFCS SEEMS BETTER THAN BASIC UH-60.	REQUIREMENT TO MONITOR POWER WHEN MAKING LARGE INPUTS. OCCASIONALLY VERY SENSITIVE IN YAW. SEEMED TO OCCURE WHEN WORKING MULTIPLE AXIS (NOT A DISLIKE)	WOULD LIKE TO SEE VERO OF A/C CAPABILITIES BY PILOT WITH RELATIVELY HIGH TIME ON SYSTEM. NON-RATED UH-60 PILOTS SHOULD NOT BE PROHIBITED FROM PERFORMING LANDING OPERATIONS.	PILOT IN THE LOOP SHORT TERM TOUCH ALL UP SYSTEM. PITCH SEEMS MORE SENSITIVE THAN ROLL BUT NOT A PROBLEM. DIFFICULT TO BE AGGRESSIVE WITH SYSTEM WOE, MAYBE YAW PROGRAM IS GREAT AND WELL RUN.
JOHN	HAGEN	PITCH AND ROLL CHARACTERISTICS IN ALL MODES OF "T". REDUCED HOWER LEVELS WITH SELECTABLE MODES.	DIFFICULTY IN ESTABLISHING DESIGNED POWER SETTING FOR LEVEL/CLIMB/DESCENT IN FORWARD FLIGHT. DIFFICULTY IN COORDINATING TO DIRECTIONAL CONTROL WITH PITCH/ROLL IN SINGLE CONTROL. DIFFICULTY IN PRECISELY MODULATING VERTICAL CONTROL DURING TAKEOFF/LANDING PHASES (VERT., RUMBLING, SLOPED). DIFFICULTY IN COORDINATING NECESSARY CONTROL INPUTS DURING GROUND TAXI.	IMPROVED REFERENCE SYSTEM FOR HOWER ASSIST. DIRECTIONAL CONTROL CHARACTERISTICS. DIGITAL A/S READOUT WITH KEEP CAPABILITY. ANNUNCIATOR PANEL ABOVE ATTITUDE INDICATOR FOR MODE STATUS.	4-0 CAPABILITY A PART OF USER DESIRED WITH LEFT SIDEARM CONTROLLER. SOME TYPE OF SIGHT FOR AIR/GND AIR/AIR. INTEGRATE WITH FLIGHT DIRECTOR.

ADCS USER DEMONSTRATION PILOT EVALUATION COMMENTS		ADCS USER DEMONSTRATION PILOT EVALUATION COMMENTS		ADCS USER DEMONSTRATION PILOT EVALUATION COMMENTS	
FIRST NAME	LAST NAME	LINES	DISLIKES	IMPROVEMENTS	ADDED FEATURES
JAMES L.	LEWIS	THE ADCS SYSTEM IS AN EXCELLENT CONCEPT FROM THE STAND POINT OF REDUCTION OF WEIGHT AND EN/EMP. MANY OF THE ADCS MODES OF ADCS REDUCED PILOT WORKLOAD SIGNIFICANTLY. WITH FURTHER APCS SHARPENING THE CONTROL WOULD GIVE THE PILOT EXACTLY WHAT HE NEEDS TO ACCOMPLISH THE MISSION. ALT WOULD WORKED VERY WELL.	YAW AXIS WAS DIFFICULT (TOO SENSITIVE & NOT HARMONIC) AS COMPARED TO PITCH & ROLL AXIS. COLLECTIVE DID NOT PROVIDE FEEDBACK TO PILOT AS TO THE POWER THAT IS BEING APPLIED TO A/C (OTHER THAN ENGINE SOUND AND A/C RESPONSE). IN INFIGHT HOLD AGGRESSIVE CONTROL MOVEMENT COULD BE DIFFICULT IN INDICATED PIO. HOWEVER ASSIST AND SLIGHT DRIFT. GROUND TAXI WAS DIFFICULT TO CONTROL.	I WOULD TAKE WHAT YOU HAVE DONE AND CONTINUE TO FINE TUNE AS YOU ARE DOING AND I WOULD TRY TO THE CONTROLS MORE RANGE TO GIVE THE PILOT A BETTER FEEL FOR THE CONTROLS.	READING RETENTION AS OPPOSED TO HANGING HOLD SHOULD BE AVAILABLE IN ALL MODES OF FLIGHT (EXCEPT WHEN THE PILOT IS IN THE LOOP). THIS WILL PROVIDE HIM WITH A REFERENCE READING THAT MAY DRIFT SLIGHTLY BUT IS NOT AS RIGID AS HANGING HOLD.
WILLIAM J.	MARSHBANK	THE BEST PART OF THE SYSTEM IS THE REDUCTION OF PILOT WORKLOAD! ALSO THE REDUCTION OF MOVING PARTS WILL DECREASE BOTH THE POSSIBILITY OF FAILURE AND THE WEIGHT OF THE A/C. THE USE OF FIBER OPTICS REDUCES AN A/C VULNERABILITY TO ENI WHICH IS A MUST WITH THE SYSTEM.	THE LACK OF FEEL IN THE CONTROLS IS A PROBLEM WITH THE SYSTEM. FOR EXAMPLE, IF I HAD A SLING LOW MISSION AND HANGOVER OVER A LOW IT WOULD BE VERY EASY TO OVER-CONTROL THE A/C AND HURT SOMEONE. (I.E. TOO MUCH DEMAND PRESSURE ON THE COLLECTIVE CAUSING A DESCENT OF THE A/C POSSIBLY CRASHING THE SLING MAN UNDER THE A/C)	A COMPLETELY AUTOMATIC PILOT ALL OF THE HANDLING QUALITIES ARE GREAT BUT WE HAVE NOT TRIED THIS AT NIGHT WITH WING'S AND UNDER OUR MISSION PROFILE. I THINK THE NEXT STEP SHOULD BE TESTING AT NIGHT IN DIFFERENT MISSION PROFILES.	ALL OF THESE ARE A MUST IF WE ARE TO PERFORM OUR MISSION. THE SYSTEM IS EASY TO FLY DURING THE DAY AND NON-TACTICAL MODES. HOWEVER, IF THE PILOT WAS REQUIRED TO PERFORM A MISSION AT NIGHT WITH LITTLE REST AND WITHOUT ALL OF THESE MODES AVAILABLE TO HIM HE MIGHT NOT BE ABLE TO COMPLETE THE MISSION.
MICHAEL P.	ROSS	THE ELIMINATION OF WEIGHT, THE ELIMINATION OF RIGGING, THE ELIMINATION OF COMPONENTS WHICH LEAK OR COULD FAIL, SAVED HUNDREDS RESULTED FOR PRESENT DAY TECHNOLOGY. THE EASE OF LOCATING A BROKEN LINE, LIMIT OF DOWN TIME IN QUICK REPAIR, REDUCTION OF PILOT WORKLOAD, EN/EMP PROTECTION REDUCTION, SURVIVABILITY THRU REDUNDANCY, QUICK BATTLE DAMAGE REPAIR, AND ALT HOLD, VEL STAB AND OTHER HONOR AIDS ARE OUTSTANDING. RESPONSIVENESS IN FLIGHT CONTROL IS VERY GOOD.	NOTHING, IT WAS GREAT POTENTIAL IN PROVIDING THE NECESSARY CONTROL DEMANDS BY THE NEXT GENERATION OF A/C IN A COMPLEX BATTLEFIELD ENVIRONMENT.	A SELECTABLE CONTROL PANEL FOR BAROMETRIC ALTITUDE SELECTION AND FORWARD LOOKING BOOMER COUPLED TO INDOOR ALTITUDE FOR WING/ANG OPERATIONS OR COMPUTER IMAGE INTERPRETATION ABILITY COUPLED INTO FLIR SYSTEMS.	WITH FUTURE IMPROVEMENTS WITH A BETTER DOPPLER SYSTEM C,D,E WILL IMPROVE. I WOULD LIKE TO SEE A SELECTABLE ALTITUDE CONTROL.
MICHAEL J.	MUTSON	THIS IS A SYSTEM - REGARDLESS OF THE TYPE OF THE FLIGHT CONTROLS USED - THAT THE ARMY NEEDS NOW. JUST THE REDUCTION IN PILOT WORKLOAD WOULD SIGNIFICANTLY	(FLT 1) I FELT THE YAW CONTROL DURING GROUND TAXI OPERATIONS WAS TOO SENSITIVE. (FLT 2) IT TURNS OUT THAT THE YAW CONTROL WAS NOT MY PROBLEM. ONCE I	FOR MISSION TASKS - MOST IMPORTANTLY EXTERNAL LOAD OPERATIONS - THE IND ALT HOLD SHOULD BE COUPLED TO A DIGITAL AND ALT SO EXACT MORE TRAINING. (FLT 2) THERE ABSOLUTE ALTITUDES COULD BE	THIS IS A SYSTEM - REGARDLESS OF THE TYPE OF THE FLIGHT CONTROLS USED - THAT THE ARMY NEEDS NOW. JUST THE REDUCTION IN PILOT WORKLOAD WOULD SIGNIFICANTLY

ADCS USER DEMONSTRATION
PILOT EVALUATION COMMENTS

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R.I.	NORTON	OPERATIONS. EXCELLENT HANDLING QUALITIES FOR THE LOW GAIN TASK. I BELIEVE THAT HIGH GAIN TASKS ARE NOT POSSIBLE DUE TO THE DOCS MONITOR TAILORING HANDLING QUALITIES. COMFORTABLE SENSING POSITION. TRIM BACK-UP. GOOD. ACCURATE BRHO HEIGHT HOLD. TURN COORDINATION. VERSATILITY.	VERTICAL AXIS IMPTOR - NO POSITION FEEDBACK. YAW AXIS TOO SENSITIVE. HIGH CONTROL FORCES WERE FINE TUNING DIFFICULT. 3-1 CONTROL METHOD. I PREFER THE 2-1-1 ESPECIALLY FOR MULTI AXIS MANEUVERING. MODE ENGAGE PANEL ON CENTER CONSOLE, SHOULD BE SHIRT OR VOICE COMMAND. STILL NOT FULLY DECOUPLED	DISPLACEMENT COLLECTIVE. YAW TRIM. SPEED TRIM. REDUCE CONTROL FORCES. ADJUSTABLE INCEPTOR POSITION. STIFFER YAW CHANNEL. MORE DE-COUPLING PARTICULARLY COLLECTIVE TO PITCH, PITCH TO ROLL, YAW TO ROLL (IN HOWER). REDUCE PHYSICAL CROSS-COUPLING IN THE CYCLIC INCEPTOR. IMPROVE THE YAW CHANNEL CONTROL LAMS SUCH THAT 3-1 CONTROL PHILOSOPHY IS ACCEPTABLE.	YAW IMPROVE "MODE SELECT" FEATURE PLUS HEADS UP INDICATION OF AFCS STATUS. TUMBLE COMMAND SYSTEM. (PERHAPS SLAVED TO A BUG ON THE HEADS UP ALTITUDE). HOWER TRIM FOR LOW AIRSPEED. SPEED REEF FOR UP AND AWAY. CROSS-COUPLING IN THE CYCLIC READING ACQUITE MODE?	HOVER TASK. VERY OF THESE MANEUVERS WERE VERY VERY EASY TO PERFORM. THOSE THAT I HAVE ASSESSED LEVEL 2 ARE MAINLY DEGRADED BY THE YAW CHANNEL AND A GOOD CHUISE MODE OR YAW TRIM MAY WELL SOLVE THE PROBLEM. AUTOMATION CAUSED A SYSTEM OR POOR WEATHER. THE METHOD OF MODE SELECT/DESELECT WAS TRIPS BECAUSE I KEPT THE LEVER DOWN BELOW ITS BOTTOM STOP. A GOOD EXAMPLE OF THE POOR POWER QUES PRESENTLY PROVIDED.	THE MODES WERE USEFUL AND IMPROVED TASK PERFORMANCE WHILE REDUCING WORKLOAD. I WATE THE HOWER ASSIST A LEAST USEFUL BUT THEN I HAVE THE MISSION DURING DARKNESS OR POOR WEATHER. THE METHOD OF MODE SELECT/DESELECT WAS POOR, THE LAST TRING A PILOT WANTS TO DO IN THE HOWER ORBITRE IN CONFINED AREAS IN TURBULANCE), IS LOOK INTO THE COOPTIT AND TAKE HIS HANDS OFF THE CONTROLS. IN SUMMARY, I FEEL THAT THE AIRCRAFT DEMONSTRATED EXCELLENT HANDLING QUALITIES FOR LOW GAIN TASKS. I WAS NOT ABLE TO FLY VERY AGGRESSIVELY, DUE TO THE DOCS MONITOR, BUT FEEL THERE MAY BE PROBLEMS WITH MULTI-AXIS MANEUVERING.
WILLIAM A.	CREEK	RAD ALT HOLD IS THE GREATEST ROLL ON LANDINGS WERE VERY FEATURE. THIS IS A GREAT HELP IN THE SCOUT/ATTACK ROLE. LIKEWISE ON THE BOB-UP & HOWER HOLD.	CONTROL IS GREAT BUT IT HINDERS ROLL ON CAPABILITIES.	CREATE A CONSTANT PITCH ANGLE THAT THE PILOT CAN SET FOR GROUND TAXI INSTEAD OF HOLDING CONSTANT PRESSURE. I CAN ROE SEE PILOTS PROBLEMS IN CHANGING THE FLIGHT CONTROL LAMS DURING FLIGHT. THIS FEATURE IS NICE & IS NEEDED BUT THE PILOT NEEDS TO BE VERY AWARE IT RAD ALT IS ON OR NOT.	ABILITY TO ESTABLISH AND MAINTAIN A RATE TURN IN HOWER. RELEVANT PILOT FROM HAVING TO HOLD FORCE (LONGITUDINAL) FOR LARGE AIRSPEED CHANGES. MAKE SYSTEM MORE TOLERANT TO LARGE ABUPT CONTROL INPUTS. IN HIGH STRESS/ACROBATIC SITUATIONS SUCH AS BOB UP (WHEN SOMEONE IS SHOOTING AT YOU) OR AIR TO AIR COMBAT ABUPT MOVEMENTS WILL NOT BE UNUSUAL. IF DISPLACEMENT COLLECTIVE IS NOT FEASIBLE	AUTOMATIC RATE C SINCE I SUSPECT THE PILOT WILL HAVE A DIFFICULT TASK MAKING A TOUCHDOWN WHILE OPTIMIZING USE OF ROTOR RPM. OTHER PROBLEMS ARE CAUSED BY REQUIREMENT TO HOLD LONGITUDINAL FORCE AND QUICK ATTITUDE CHANGE WHEN LONGITUDINAL FORCE IS RELEASED.	ALL CONTRIBUTE TO REDUCE PILOT WORKLOAD. A SHORT SYSTEM DESCRIPTION WWOOUT THAT GUEST PILOTS COULD REVIEW PRIOR TO FLIGHT WOULD BE HELPFUL.
RAY	DUMM	COOPTIT SEEMED SPACIOUS WITH SIDEARM CONTROL. UP AND AWAY ROLL RESPONSE WAS CRISP AND DECREAT. AIRSPEED HOLD WAS GOOD ONCE ESTABLISHED. VEL STAB AND HOWER HOLD WORKED WELL.	COLLECTIVE DIFFICULT TO SET AT SPECIFIC SETTINGS - NO CUES AS TO POWER DEMANDED CHAS TO KEEP CHECKING GAGES). NOT SURE HOW YOU WOULD MANOLE IN AUTOMATICALLY TOUCHDOWN. YAW TENDENCY TO GET IN THE LOOP AND OVER CONTROL IN HOWER. VERY DIFFICULT TO SMOOTHLY LAND FROM A HOWER, PUSHING OR COLLECTIVE FELT UNNATURAL AND ROLL/YAW WERE OVER CONTROLLED.	MAKE COLLECTIVE DISPLACEMENT TYPE. PILOT ISN'T DURING ANYTHING WITH THE FEET - GIVE HIM YAW CONTROL. SMALL IS CONSISTENTLY OUT TO THE RIGHT (.25-.5), CORRECT. FOLLOWING LONGITUDINAL INPUT, AIRCRAFT RETURNS TO "LEVEL" ATTITUDE TOO FAST. AIRCRAFT TURNED LEFT 3-4 DEGREES WHEN POWER INCREASED UP & AWAY - FIX.	MAINTAIN A RATE TURN IN HOWER. RELEVANT PILOT FROM HAVING TO HOLD FORCE (LONGITUDINAL) FOR LARGE AIRSPEED CHANGES. MAKE SYSTEM MORE TOLERANT TO LARGE ABUPT CONTROL INPUTS. IN HIGH STRESS/ACROBATIC SITUATIONS SUCH AS BOB UP (WHEN SOMEONE IS SHOOTING AT YOU) OR AIR TO AIR COMBAT ABUPT MOVEMENTS WILL NOT BE UNUSUAL. IF DISPLACEMENT COLLECTIVE IS NOT FEASIBLE	AUTOMATIC RATE C SINCE I SUSPECT THE PILOT WILL HAVE A DIFFICULT TASK MAKING A TOUCHDOWN WHILE OPTIMIZING USE OF ROTOR RPM. OTHER PROBLEMS ARE CAUSED BY REQUIREMENT TO HOLD LONGITUDINAL FORCE AND QUICK ATTITUDE CHANGE WHEN LONGITUDINAL FORCE IS RELEASED.	ALL CONTRIBUTE TO REDUCE PILOT WORKLOAD. A SHORT SYSTEM DESCRIPTION WWOOUT THAT GUEST PILOTS COULD REVIEW PRIOR TO FLIGHT WOULD BE HELPFUL.

ACCS USER DEMONSTRATION PILOT EVALUATION COMMENTS					
FIRST NAME	LAST NAME	LIKES	DISLIKES	IMPROVEMENTS	ADDED FEATURES
GARY	JEROLD	ROLL STABILITY WAS OUTSTANDING. ALL SELECTABLE MODES REDUCE PILOT WORKLOAD TO A GREAT EXTENT.	COLLECTIVE INPUTS ARE TOO DIFFICULT TO MODULATE UP AND AWAY. I.e. THERE ARE NO TACTILE CUES TO LET YOU KNOW WHAT POWER SETTING IS DOING FOR YOU (WITHOUT CONSTANTLY LOOKING AT THE TORQUE STRIPS.)	DISPLACEMENT COLLECTIVE. CHANGE THE LOCATION OF THE HSSP TO THE FRONT CONSOLE TO PRECLUDE "FUCKING YOUR EYES FROM OUTSIDE THE COOPIT TO INSIDE".	THEN FORCE COLLECTIVE SYSTEM MUST PERMIT PRECISE POWER ADJUSTMENTS.
ROBERT L.	RAYLUM	SIDEARM CONTROL - FEELS MORE NATURAL THAN A CONTROL WHEEL. CONTROL RESPONSE - THOUGHT THAT SENSITIVITIES WERE GOOD FOR ME IN ALL AXES BUT VERTICAL WHICH I PERCEIVED A SLIGHT LAG BETWEEN INITIATING A FORCE ON MY FINGER TIPS & GETTING A RESPONSE ON THE ALTIMETER AND TORQUE METER. VERY NICE 1/8" PLATFORM - AIRSPEED AND ALTITUDE HOLD FEATURES. CONTROL RESPONSE IN THE ROLL AXIS - GOOD SENSITIVITY, PREDICTABLE, ADEQUATE HINTS. CLEAR VIEW OF INSTRUMENT CONSOLE AIDS MISSION CAPABILITIES. INNOVATIVE OFF-FLYING ALLOWS A SINGLE PILOT TO PERFORM ADDITIONAL TASKS (CRUISE INDIC, ETC.). OUTSTANDING STABILITY, WOULD BE FANTASTIC UNDER INC.	CONTROL RESPONSE IN YAW - REQUIRED TOO MUCH COMPENSATION & ADAPTING. YAW CONTROL IS SOMEWHAT AWKWARD BUT COULD BE OVERCOME WITH EXPERIENCE.	TORQUE SENSING WITH AIRCRAFT COMMAND ALTITUDES FED INTO AUTOMATIC MODE SELECTION; SOME ARTIFICIAL INTELLIGENCE FOR VERTICAL AXIS TO ALLOW ALTITUDE HOLD FOR STRATEGY/LEVEL INDICATOR INC. IMMEDIATELY (HOLD) THEN RELEASE THE ALTITUDE HOLD FOR AN ACCELERATION OR RATE CONTROL. HAVE AIRSPEED HOLD PILOT SELECTABLE AND THE NORMAL MODE BE ALTITUDE HOLD FOR PITCH.	DID NOT GO INTO GROUND EFFECT OF ATTEMPT A FLARE WHENEVER ON AUTOMATION. COUPLE CLIMBS AND DESCENTS WERE DONE WITH SMALL CHANGES IN ALTITUDE (<1500 FT).
LES	STURT				
TIMOTHY A.	KRANTZ				
DOUGLAS A.	CHILL	OUTSTANDING SYSTEM. I REALIZE THE SYSTEM HAS BEEN INSTALLED ON THE MOST AIRCRAFT DO TO DESIGN OF THE TAIL MOTOR ON THE UH-60. I WAS EXTREMELY PLEASED WITH THE PERFORMANCE AND OFFER THE FOLLOWING COMMENTS. PRECISE ROLL RESPONSE. AUTOMATIC FORCE TRIM VERY GOOD. GOOD GRIP SECURITY & COMFORTABLE ARM REST ARRANGEMENT. GOOD POWER ASSIST MODES.	IN FLIGHT FOR COORDINATED FLIGHT THE BALL MUST BE DRIVEN BACK TO THE CENTER. THIS COULD BE AUTOMATIC IN COORDINATED FLIGHT WITHOUT PILOT INPUT AT LOW SPEED AND POWER.	AS A FOLLOW ON CONSIDER THE FOUR AXIS SIDE ARM CONTROLLER. THE ADJECT SAFETY PILOT, JOHN BISHOP, PERFORMED HIS MISSION IN AN OUTSTANDING MANNER. HIS ABILITY TO DEMONSTRATE THE SYSTEM IS SUPERB.	INSTRUCTOR PILOT/SAFETY PILOT (JOHN BISHOP) DID A COMMENDABLE JOB DURING THE DEMONSTRATION FLIGHT. WELL VERSED IN THE SYSTEM PERFORMANCE AND ABLE TO CLEARLY COMMUNICATE THE SAME. SEE COMMENTS ON QUESTIONNAIRE.
BRUCE	BLAKE				