A SURVEY OF F-16 SQUADRON LEVEL PILOT TRAINING IN THE PACIFIC AIR FORCES (PACAF)

Thomas H. Gray, Bernell J. Edwards and Dee H. Andrews
U.S. Air Force Systems Command
Armstrong Laboratory
Aircrew Training Research Division
Williams AFB, AZ

ABSTRACT

At the direction of Air Staff and Systems Command, Armstrong Laboratory conducted a study of operational squadron level flying training. Budget reductions in the formal training unit have focused interest in training at the squadron level. The objective of the laboratory study was to identify training requirements and shortfalls in the operational squadron and to determine areas where technology development could offer potential solutions.

The approach followed a training needs assessment model in obtaining information from training managers and operational squadron pilots. F-16 squadrons located in the Pacific Air Forces were chosen for study as the most likely population for generalizability of findings. About 2/3 of all pilots assigned to PACAF F-16 units participated in the data collection. Content areas investigated included flying, ancillary training, and professional military education, but the emphasis of the study was on flying training programs.

Survey findings appear valuable as preliminary indicators for improved training technology applications. Major findings were as follows: (1) Maintaining air combat proficiency is the most difficult single aspect of sustaining mission readiness in these squadrons. (2) Multi-force, dissimilar aircraft air combat training was the primary area where more and better training is needed. (3) Specialized training in certain skill areas including weapons systems/delivery and electronic combat is needed. Specifically focused technology development could improve training in all of the above areas, with a view toward improving the integration of combat skills in the cockpit through advanced simulation capabilities. Technology emphasis at the squadron level would significantly offset effects anticipated from cuts in schoolhouse programs. Other findings are also presented.

ABOUT THE AUTHOR

Thomas H. Gray

Dr. Thomas H. Gray received his B.A. in psychology from Vanderbilt University in 1953. He received his M.A. in 1958, and his PhD in 1963 from the same institution. From 1963 to 1966, he was a research psychologist with the Human Resources Research Organization at Fort Rucker, Alabama. In 1966 he joined Lockheed Aircraft Corporation at Marietta, Georgia, as Senior Human Factors Engineer. In 1967, he became the Staff Psychologist for the Marine Systems Center of Honeywell, Inc., West Covina, California. In 1972, he joined the Human Resources Laboratory (now the Armstrong Laboratory), Aircrew Training Research Division, Williams AFB, Arizona, where he is presently Special Projects Officer.

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INTRODUCTION AND BACKGROUND

The current trend in Air Force aircrew training toward reducing training curricula in the centralized formal training units (FTUs) is placing increasing demands upon the operational units to train "on their own." In a very real sense, any deficiencies in the training process prior to the operational assignment of aircrews are absorbed by the operational squadron and must be corrected by the unit in order to qualify pilots as mission ready (MR). The implications of "schoolhouse" training reductions prompted Headquarters USAF and Air Force Systems Command to direct a study of squadron level requirements and practices to identify potential contributions of new technology.

The operative agent for the study was the Armstrong Laboratory. The study was partitioned into maintenance and aircrew specialty areas. This paper summarizes the aircrew training portion of the study. Three areas of training were investigated, with emphasis upon the first: job-related (pilot) training, ancillary training, and professional military education (PME).

Because the effort could not include all Air Force training programs, the investigation was limited to a single weapons system, with possible expansion of the effort if warranted by the results. The F-16 was selected as the weapon system for study because: (1) it is a front-line multi-role fighter and a mature weapon system; (2) it will remain in the inventory well into the next century; (3) its deployment is worldwide so there are many geographical options for field study; and (4) the laboratory has a long history of F-16 pilot training R&D.

The F-16 operational community in the Pacific Air Forces (PACAF) was selected for study because analysis revealed these squadrons probably represented the "worst case" in terms of training technology application. As the units farthest removed from the CONUS "schoolhouse", they have the longest logistical "tail" for training device support. Therefore, if research and development solutions proved feasible for squadrons in PACAF, they probably could be expected to work elsewhere.

The objective of phase one was to survey PACAF F-16 squadron level training requirements and problems to determine how such requirements might be met by existing or future R&D efforts within the laboratory. In general, the study was conducted as a needs assessment following conditions identified by Kaufman and English (1979) as essential. These were: first, appropriate questions must be determined; second, the questions must be properly posed to the appropriate subject population; and third, resulting data must be correctly interpreted. These steps, properly performed, will yield reliable and valid findings.

PROCEDURES

Questionnaires

Two questionnaires were developed; one for command and staff personnel and one for operational pilots. Both were written by Air Force research pilots and psychologists, with extensive consultation from subject matter experts in various agencies including Air Staff (AF/XOOTW), Tactical Training Command (4444 OTD and 58 TTS), and Headquarters, PACAF/DOOT. The questionnaires were designed for use in open-ended, structured interviews. The command/staff questionnaire was comprised of questions to ascertain attitudes, and opinions of unit management toward flying training policies, practices, and

issues. The aircrew questionnaire focused upon mission training requirements, perceived quality of training, methods and media, training planning, programming, and evaluation, ancillary training and professional military education. The questionnaires were reviewed and validated by Headquarters, PACAF prior to field administration. Use of the survey for data collection was approved by the Air Force Manpower Personnel Center (MPC).

Data Collection

Data were collected on-site at all F-16 bases in PACAF. These were Osan Air Base (7th Air Force, 51 TFW, 36 TFS) and Kunsan Air Base (8 TFW, 35 and 80 TFS) in Korea; and Misawa Air Base (5th Air Force, 432 TFW, 13 and 14 TFS) in Japan. A total of 20 management and 99 aircrew personnel were interviewed during the data collection. The aircrew sample represented about two-thirds of all pilots assigned to PACAF F-16 squadrons.

Aircrew interviews were conducted by two-man laboratory teams composed of a fighter pilot and a research psychologist. Interview questions were asked by the research pilot following questionnaire content, with the psychologist recording and annotating pilot responses on the questionnaire form. The pilot-to-pilot dialogue enhanced communication and rapport. Interviews were open-ended and informal, usually with two or three pilots.

Data Analysis

Because of the subjective nature of many of the questions, the principal technique employed was content analysis. For those portions of the squadron level questionnaire involving the use of rating scales, descriptive and inferential statistical analyses were used as appropriate.

FINDINGS

As a means of moving from specific to general findings in this paper, data from the squadron level survey will be presented first, followed by the more general findings from the management survey.

Mission Training Requirements

Formal training requirements for squadrons are documented in MCM 51-50, which also defines prerequisites for Mission Ready (MR) status. In order for the survey to get beyond the formal requirements, pilots were asked to identify other "drivers" of training. As a related item in this part of the survey, pilots were asked to identify any aspects of their mission training they felt needed more emphasis or better training.

Assuming that the wing/unit training plan is included with the 51-50 regulation, there were only two other significant "drivers" of training. About 31% of the pilots identified exercises and deployments, while 18% identified upgrade training.

Regarding aspects of the mission needing more emphasis or better training, 43% indicated "increased air-to-air combat;" an additional 25% gave a closely related answer, "more multiship and dissimilar aircraft training," so that combined, these two were mentioned by two thirds of the pilots. Thirteen percent wanted more electronic combat/warfare training. Ten percent indicated that more weapons delivery training (with suitable ranges) was needed, and eight percent of the pilots said more radar intercept training should be provided.

The weight placed on air-to-air combat and dissimilar aircraft training was disproportionately allocated when squadron location is considered. These two tasks constitute the majority of responses from the Kunsan AFB squadrons, indicating a clear bias for such training. At Osan and Misawa, on the other hand, air-to-air and dissimilar aircraft training were much less prominently mentioned. This difference may be attributable to differences in missions.

Mission Readiness Attainment/Maintenance

Pilots were asked to identify the most difficult aspects (tasks/skills) to acquire and

maintain for mission ready (MR). Those identified by pilots as most difficult (in order of harder to easier) were:

1. Weapons delivery
2. Radar interpretation
3. Electronic combat
4. Cockpit switchology
5. Air-to-air combat

Responses of instructor pilots on hard-to-learn tasks were more diverse than wingman and flight lead pilots, but instructors did concur that weapons delivery and cockpit switchology were difficult tasks to learn.

The hard-to-maintain tasks present a somewhat different picture. In this case, opinions of instructors wholly concur with those of less experienced pilots. This listing was:

1. Air-to-air combat/dissimilar aircraft
2. Weapons delivery
3. Radar interpretation

Only 24% of the pilots indicated that lack of training aids/media was a significant factor in attaining or maintaining mission readiness.

Perceived Quality of Training Program. Pilots were asked to rate the quality of various aspects of their training programs. The questionnaire was structured to assess opinions about the various phases of training which occur during the pilot's assignment at these squadrons. Normally, the entry level pilot first becomes MR at the level of wingman, during the first 45 to 60 days in the unit. After appropriate intervals, and based upon squadron manning requirements, pilots typically upgrade to flight lead status and thereafter to instructor pilot. Pilots were asked to rate these programs individually. Ratings were based upon a 4-point scale as follows:

1	2	3	4
marginal	adequate	good	very good

Mission Qualification Training (MQT). Pilot ratings for MQT were divided into inflight and ground training activities. The ratings for MQT were broken down by type of tour (short or long) and by primary mission. For any marginal or adequate rating given, the respondent was asked to indicate whether deficiencies were primarily internal (within squadron control) or external (outside of squadron control).

Average MQT Flight Ratings:

Group	Rating	
Short tour (Korea)	adequate-good	\ (p = .01)
Long tour (Japan)	good-very good	/
Nuclear mission	adequate	\ (p = .05)
Lantirn mission	adequate-good	/
Close air support mission	good	/

Of those pilots rating their MQT inflight programs adequate or marginal, 45% cited internal factors as responsible, while 55% named external factors.

The results of the anlysis of the ground training portion of MQT corresponded to those of the in-flight portion. Pilots on a short tour rated the training as slightly better than adequate while their counterparts on a long tour rated it as slightly below good. When mission type is considered, both the LANTIRN mission squadron and the nuclear mission squadron rated MQT ground training as adequate. The close air support mission squadrons rated it as good. Considering MQT ground training, overall, more than one-half of the pilots rated it marginal or adequate. Of these, 78% cited internal deficiencies, while 22% blamed external deficiencies.

Average MQT Ground Training Ratings:

Group	Average rating	
Short tour	adequate +	\ (p = .05)
Long tour	good -	/
Nuclear mission	adequate	\(p = .05)
Lantirn mission	adequate	/
Close air support	good	/

Areas of training identified as warranting more emphasis or improved training (in order of frequency of mention) were:

1. Electronic combat
2. Weapons delivery
3. Mission planning
4. Switchology

As regards training device support, 35% of pilots believed the following areas of MQT ground training needed improvement:

Training Area	Percentage of response
electronic combat	63
switchology	17
weapons system trainer	10
videotape	10

Operational Instructor Pilot Upgrade Program. Of the pilots surveyed, 18% had undergone local instructor pilot upgrade training. 78% of these pilots rated the inflight portion as good. Twenty-two percent of these pilots indicated improved training was needed for this program, principally in the areas of air combat and weapons delivery. The average rating of these pilots for the ground training portion of the program was between adequate and good. The perceived source of deficiencies was almost universally cited as internal problems caused by poor planning. There was also near unanimous agreement on the need for more training of instructors on how to teach and grade less experienced pilots, i.e., "teaching to teach." In terms of media inadequacies, lack of suitable training aids to support radar interpretation and electronic combat was frequently mentioned.

Mission Training (Continuation Training [CT]). Finally, pilots were asked to rate the quality of that portion of training involving the on-going, advanced piloting activity in which the journeyman F-16 pilot becomes an expert.

Average CT Flight Ratings:

Group	Rating	
Short tour	adequate +	\ (p=.01)
Long tour	good -	/
Nuclear mission	adequate	\ (p=.01)
Lantirn mission	adequate-good	/
Close Air Support	adequate-good	/

Differences in average ratings between the short and long tour pilots and the ratings of pilot groups be mission were statistically reliable at the .01 level. Perhaps more revealing, however, 55% percent of the pilots rated the inflight portion of CT as marginal or adequate, 40% attributing their ratings to deficiencies of an internal nature and 60% to external factors.

Pilots were almost equally divided in their perception of CT as revealed by their selection of verbal descriptors to characterize the program. Fifty-one percent believed it to be "an objective, goal-oriented activity producing a planned increase in skill," while forty-nine percent said it was "primarily practice and filling 51-50 squares."

A substantial majority (79%) of pilots perceived CT as needing more emphasis or improvement in specific areas. Fifty-three percent said multiship air combat was the most critical area to emphasize. As regards ground training, sixty-nine percent said it needed more emphasis in the following areas (in order of importance):

1. Electronic warfare
2. Weapons employment
3. Mission planning
4. Tactics

Aircraft Systems Ground Training. Pilots were asked to rate the adequacy of ground training in their squadrons for operation of several major subsystems of the aircraft, i.e., Fire Control Radar, Radar Warning Receiver/ Electronic Countermeasures, Fire Control Computer, Headup Display, and weapons. Mean ratings of ground training for all of these systems ranged between adequate and good.

The perception of quality attendant to systems training appears to leave considerable room for improvement and thus bear implications for the potential contribution of technology.

Major Factors influencing Flying Training. Pilots were asked to identify factors most affecting flying training. Ninety-five percent identified negative, rather than positive factors. Factors identified were all of an external nature. The most prominent factors in order of frequency of mention were:

1. Weather
2. Limited Availability of Ranges/Airspace
3. Tasking from Higher Headquarters
4. Pilot Upgrade Program Requirements
5. Plural Mission Tasking

6. Pilot Turnover
7. Combined Exercises with Other Units

Training Evaluation

One-third of the pilots indicated that their units use methods, other than 51-50 regulations, to evaluate mission training effectiveness. Of these, 1/2 said the most important indicators of mission effectiveness training were "war games" such as Top Gun, Cope Thunder, turkey shoots, and first look surface attack tactics (SAT) activities. Mentioned as less important were such activities as local operational readiness inspections (LORIs), exercises, and checkrides.

Seventy-eight percent of pilots indicated their units employed some systematic process to evaluate unit performance. Personnel performing this function were usually weapons shop personnel and/or standard evaluation types. Many pilots mentioned that the unit DO regularly reviewed such evaluations.

Skill Decay following Formal Unit Training

There is typically a time lapse of six weeks to two months between the time the pilot completes F-16 formal unit training in CONUS and the time he arrives at the PACAF operational squadron. Pilots were asked if they experienced any loss of flying-relevant skill or knowledge during the interim, and if so, if they considered it of a sufficient magnitude to warrant the development of methods or devices to aid retention of such skills/knowledge. Responses to these questions were markedly different between pilots in the Korea and Japan squadrons. Answers are shown below:

Group	Loss of skill?		Develop Methods/Devices?
	yes	no	yes
Korea squadrons	67%	33%	70%
Japan squadrons	64%	36%	24%

Ground Training Methods/Media

Several data findings relevant to this area emerged from the surveys. While there are no formal academics, pilots do spend considerable time in knowledge acquisition activities including group lesson/discussions and knowledge testing. The reported ratio of lessons to testing was about 80% to 20%. Of the total time pilots spend in ground training activities, they reported an average of 51% was spent in a self-learning mode, and for the most part, without the availability of materials that can be used outside the squadron. Anecdotal evidence accompanying this finding suggested a considerable amount of time is spent by pilots, especially those new to the squadron, reading classified materials in the squadron documents vault.

Pilot were asked if there were content areas of ground training that suffer significantly from the lack of effective training aids and media. Seventy percent of respondents indicated there were no significant deficiencies. Of the 30% who responded yes, many indicated which areas needed improvement. In order of most frequently mentioned training areas, the top ten were:

1. Electronic countermeasures
2. Threat recognition/knowledge
3. Emergency procedures
4. Radar/radar warning receiver
5. Air Intercepts
6. Auto Identification Friend/Foe
7. Rules of engagement
8. Life support systems
9. Digital radar landmass simulation
10. Avionics management

Related to perception of media value, in connection with the above question, pilots were also asked (1) to identify media <u>most frequently used</u> in mission-related training and (2) to identify which type(s) of media they <u>would like to see used more</u> for training. In order of frequency of mention, media are as follows:

<u>Most frequently used</u>	<u>Would like to see used more</u>
1. Videotapes	1. Simulators
2. Simulators	2. Videotapes
3. Overheads	3. Computerized training
4. Regs/Manuals	4. Part-task trainers & mockups

Also, prominently mentioned by pilots, was the use of subject matter experts and briefings as sources of acquiring training information.

Computer and part-task training media were also identified as desirable additions. However, these devices were not present in the squadrons at the time of the survey. It was indicated that plans called for the addition of computerized training.

Training Analysis, Management, and Evaluation

Several questions focused upon more general and administrative aspects of training activity. For example, pilots were asked to identify the primary problem in ground training. Sixty-three percent said the primary problem was that information should be taught in a better way. Twenty-seven percent thought the problem was the content of training material. Those holding this opinion believed that too much time was wasted learning unimportant information and skills. Although this appears to be primarily and management issue, technology solutions might be useful.

Pilots were asked to identify problems/hindrances to effective training management in their squadrons. The factor identified by the most pilots (30%) was under-manning (over-tasking). These pilots felt they had too much to do and too little time to do it. Twelve percent identified management/ scheduling problems. Another 11% said turnover rate (continuity) and 10% indicated the pilot upgrade process (conversion) caused a large portion of the heavy workload, especially at Kunsan. One could surmise from these responses that better management and scheduling might improve workload demands and reduce pilots' feeling of over-tasking.

Last Question

The final question asked pilots how they would improve both ground training and flying training programs in their units. The most frequently mentioned responses appear below:

Ground Training

Better use of technology/media	28%
Systematic Instruction	11%
Better Training Management	6%
More efficient use of training time and trining preparation	5%
More/Better ECM	4%

Flying Training

Reduce Tasking	9%
Better Training Management	9%
More/Better DACT	8%
More Flying Hours	8%
More/Better ACBT	7%
More Range/Airspace	5%

By far, the most mentioned factor in ground training was more/better training technology media. Many of the pilots had access to fairly sophisticated training media during their formal unit training and recognized that technology could be helpful in their operational assignments.

Regarding suggested improvements for the flying portion of training, the first two factors, reduce tasking and better training management tracking, are related. It is possible that time management, as well as the actual level of tasking, becomes a problem. During data collection the investigators became aware that pilots often had "slack periods" of 15 to 45 minutes interspersed with flying and other duties during their daily schedules. Improved training management and tracking systems might reduce tasking levels through process efficiency. Here technology might contribute. For example, if the squadron had effective training devices readily accessible such as computerized instruction or part-task trainers, pilots could use them during slack periods.

OVERVIEW OF FINDINGS FROM MANAGEMENT SURVEY

PACAF flying training managers were asked several questions relative to their oversight of squadron level training issues. The following is a synopsis of their responses.

When asked if additional relationships should be established with other agencies such as TAC, ATC, Air Staff, to assist your unit in training, the majority answered "no." Many felt additional contacts would merely complicate issues and add to a "an already too full plate". Actually conduits do exist and may be widened if additional relationships are needed in specific cases. For example, Misawa is considering expanding activities with Japan's Self Defense Forces.

Training exercises performed with other services and countries include Team Spirit (Navy), Cope Thunder, and Cope Fog. In Korea the units at Osan and Kunsan do some training with the Korean Air Force, primarily in close air support roles. Misawa squadrons have periodic dissimilar air combat tactics exercises with the Self Defense Forces. Wings universally report these exercises as being good and desiring more of them, in spite of language difficulties which to some extent hinder these training efforts.

No current initiatives for training development were found in this survey. It was found that, following the TAC tradition, wings focus on training (which is affected by short tours and heavy training loads). However, training syllabus revision is an on-going process in all wings. While the wings do not make direct inputs to the POM, they do communicate needs and recommendations to PACAF. Such inputs to the POM are managed from PACAF and TAF levels.

Managers answered the question, "what do you need to improve the training process in your unit?" in various ways. Those of a general nature included: removing "junk" duties, reducing ancillary training, and modernizing training methods. Standardizing the quality of the product from the FTU was mentioned by several officers. More specific answers included; good ranges and air space in Korea, full-mission simulators at all bases, and giving dedicated time to instructors to train students. A number of skill areas were called out for which improved training devices were needed. These were:

1. Electronic warfare
2. Air intercepts (multiship)
3. Aircraft subsystems (switchology)
4. Air to air DACT
5. Radar interpretation
6. Precision Guided Munitions
7. Area Navigation
8. Mission Rehearsal

Managers were asked several related questions posing a hypothetical technology transition to their units, the general query being: "If the laboratory brought you an effective training product or innovation, what would you do with it?"

The usual response was that we would test it in the unit, and if successful, put it in the unit training plan.

Other follow-on questions and typical replies were:

Q. What conditions concerning its use would apply?

A. It would have to be a turnkey operation, and address a real training need. Aircraft concurrence is an absolute. Must be user friendly as well as reliable, maintainable, and supportable. Would need a short logistics tail. Should be owned by the squadron and fit available space. Should be challenging and fun to use.

Q. What would be necessary to ensure successful transition of the technology to your unit?

A. Must have means to train operators/ instructors.

Q. Who would be your unit's transition agent?

A. DOT and Stan Eval personnel.

Q. Would such a product be more likely to be used if your unit developed it cooperatively with Armstrong Laboratory?

A. It would. However, units could not afford to send pilots to CONUS to act as SMEs for such a project. Still, operational inputs would be vital, and this might be resolved by using Luke AFB F-16 pilots recently returned from PACAF as consultants to the Lab.

SUMMARY OF FINDINGS

The following statements summarize major findings as expressed by pilots during interviews:

1. The single most difficult aspect of maintaining mission readiness is attaining and retaining air combat proficiency.

2. Two-thirds of all pilots said better/increased training emphasis was needed in air-to-air combat and multiship/dissimilar aircraft

training. Advanced simulation technology could potentially benefit both of these critical training areas.

3. Four skill and knowledge areas emerge as the most difficult to master in the process of attaining mission-ready status. These are: weapons delivery, radar use, electronic combat, and cockpit switchology. All of these areas are particularly amenable to low cost technology support as are those identified in the next paragraph.

4. Squadrons rated the inflight aspects of both mission qualification and continuation training as good, but rated ground training less favorably (adequate to good). All flying training would be improved with fewer mission types and better alternative sortie planning. Major ground training deficiencies were found in electronic combat, weapons effects, and switchology. In addition to the above areas, a majority of pilots involved in continuation training (CT) said that program needed more ground training in mission planning and tactics.

5. Regarding skill decay following FTU, while the survey did not identify types and magnitudes of such losses, it seems quite certain technology areas already described would help, if not solve this problem, particularly for the Korea squadrons.

The following statements summarize findings from the management portion of the survey. In these findings there was the same degree of consensus found in the pilot portion.

1. Most of the training problems identified in this study could be reduced substantially by changing personnel assignment policies and tour length. Although these considerations technically fall outside the scope of this training research initiative, they warrant mention. Three possible changes in assignment policies might be considered as options to alleviate difficulties in training F-16 pilots. First, by assigning only experienced (e.g., qualified as MR in the losing unit) personnel, training requirements would immediately reduce to more manageable levels. Second, following Marine and Navy practices, whole F-16 squadrons might be deployed and rotated instead of individual pilots. Third, in the Korea squadrons, the tour of duty might be accompanied and extended to three years, as are Misawa tours. However, owing to the nature of current personnel policies, it appears unlikely that such changes will occur.

2. The impact of reduced training content in the F-16 schoolhouse upon PACAF operational squadrons will be significant. More recent data from PACAF, subsequent to survey data collection, has confirmed that three to four additional weeks of training, including several more aircraft sorties, are being required by pilots now coming from FTU in order to achieve mission-ready status. It seems clear that advanced technology could substantially aid squadrons in absorbing the additional training load.

3. Embedded training in combat aircraft may not be the panacea envisioned by proponents of this technology. Opinion from the field about embedded training, as reflected in this survey was sharply divided. Some managers believed this approach could solve nearly all training problems, while others were very firm in the belief that it is far too "dangerous" to be incorporated into a front-line fighter.

4. There was considerable agreement about the potential of advanced part-task trainer technology to improve critical training shortfalls in such areas as electronic combat, weapons systems, air-to-air basic multi-ship intercepts, and switchology. This finding corresponds with data from the pilot portion of the survey. Managers interviewed almost universally endorsed this level of technology application. Judging from the response to this and related questions, the development and transition of affordable technology directly from the laboratory to the operational squadron would be technically feasible. This finding was perhaps the most important to come from this study in terms of a match between user needs and laboratory R&D output.

Training system solutions fall into two categories: device/software solutions and courseware/software solutions. The former could be applied to ground training for the critical areas mentioned above. Devices currently under development at Armstrong Lab directly relevant to these PACAF requirements are: (1) the Air Intercept Trainer (AIT); the Multi-Task Trainer

(MTT); and the Helmet-Mounted Display technology. Training courseware/software solutions are available from some existing CBITS applications, but more courseware, specific to the needs of operational units is needed, for example, in weapons systems and electronic warfare.

Research and Development Initiatives

Several possible future R&D approaches could be pursued in squadron level training. At least two hold substantial promise. One is the prototyping and evaluation of squadron-affordable technology to meet the requirements of these remote units. A recent technology initiative sponsored by the Air Force Reserve is highly relevant, paralleling the immediate needs of the PACAF F-16 community. The other area of joint R&D would be training effectiveness and cost studies of technology transition to operational units.

To conclude, the phase one survey of PACAF F-16 squadron level training revealed several significant opportunities for the application of training technology as a means of enhancing the mission readiness of operational pilots. Data from the present survey, supplemented by more recent reports from PACAF and TAC confirm the negative impact of FTU reductions upon these units. Judging from apparent trends, similar effects can be expected in operational squadrons elsewhere. From the laboratory perspective, the technology opportunity seems clear. A joint working agreement between the Human Systems Division/Armstrong Laboratory and PACAF for R&D transition is feasible and may well be the shortest technology-to-need avenue to help these operational units cope with increasingly heavy training demands. At a minimum, consulting services in simulation engineering, software enhancement, and advanced training technology could be provided to PACAF from the lab. However, it remains to be seen if the advantages of modern training technology can indeed be developed in a timely way to benefit front line fighter pilots.