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A SURVEY OF F-16 SQUADRON-LEVEL PILOT TRAINING IN PACAF

Thomas H. Gray
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April 1993

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Armstrong Laboratory studied operational squadron-level flying training to identify training requirements and shortfalls in operational squadrons 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 two-thirds 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: (a) Maintaining air combat proficiency is the most difficult single aspect of sustaining mission readiness in these squadrons. (b) Multiforce, dissimilar aircraft air combat training was the primary area where more and better training is needed. (c) Specialized training in certain skill areas including weapon 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.

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CONTENTS

	Page
Introduction and Background	1
Procedures	3
Questionnaire Development	3
Aircrew Questionnaire	3
Command and Staff Questionnaire	4
Data Collection	4
Data Analysis	6
Findings	6
Aircrew Survey Results	6
Management Survey Results	25
Discussion	29
Assignment Policy	29
Training Systems	29
SLT Initiatives	30
Air Force Implications	30
Conclusions	31
Aircrew Survey	31
Management Survey	32
APPENDIX A: Squadron-Level Training Survey	33
APPENDIX B: Management Survey	41

Tables

Table No.		
1.	Mission Readiness Level	5
2.	Position Assignment	5
3.	Skill Loss Response Percentages	13
4.	Percentage of Rankings by Pilots Across Media Types	14
5.	Media Type	14
6.	Ground Training Ratings	16
7.	Number of Responses per Problem	19
8.	Ancillary Training Methods	23

PREFACE

This report documents the aircrew training portion of Phase I of the Squadron Level Training (SLT) research program. It specifically examines the training environment at Pacific Air Force (PACAF) F-16 squadrons, identifies instructional requirements, and relates them to potential technology solutions. Technology products from this research are intended to improve aircrew training for acquisition and retention of aircrew skills. Cost/efficiency savings derivable from the introduction of new technology into training programs should result in reduction of training time and improved efficiency of instructor time. Current aircrew training areas and practices which may benefit from this research include:

1. Unit training requirements and objectives; and,

2. Usage for simulation-based training devices

The work was accomplished under Work Unit 1121-11-05, Squadron Level Training Research Project. The Project Scientist for the aircrew training portion was Dr Thomas H. Gray.

A SURVEY OF F-16 SQUADRON-LEVEL PILOT TRAINING IN PACAF

INTRODUCTION AND BACKGROUND

The United States Air Force (USAF) training program is extensive, multi-faceted, and conducted by units representing nearly every organizational level in the entire chain of command. The program includes initial training, continuation training, and refresher training in the skills and knowledge required to operate and maintain weapons systems and the systems necessary for their support. The media employed run the technological gamut from chalkboards to sophisticated, full-mission flight simulators. Training is performed in such di 'erse settings as on-the-job, formal schools, and large-scale multinational exercises and war games. The training may be tailored to instruct individuals, crews, teams and even larger organizational units.

Although USAF training represents a complex equation, it does have a common denominator. When the bottom line of mission accomplishment is considered, it is at the operational squadron where "the rubber meets the road." Given resource availability, trained personnel are what determine the squadron's capability to perform its mission. In a very real sense, all deficiencies in the training process must be rectified in some manner at the operational squadron.

This fact is recognized throughout the Air Force. As a consequence, if the trend towards reducing training curricula in the centralized "schoolhouse" continues, it will be necessary to increase the ability of the squadron to train its own. The implications of this situation prompted Headquarters USAF and Air Force Materiel Command (AFMC), (formerly the Air Force Systems Command (AFSC)), to request that the Human Systems Center (HSC) (formerly Human Systems Division (HSD)) initiate efforts to identify technologies and methods to improve training at the unit level. The operative agent was the Armstrong Laboratory's Human Resources Directorate (AL/HR) and the actual work was performed by the Technical Training Research Division (AL/HRT) at Brooks AFB, TX and the Aircrew Training Research Division (AL/HRA) at Williams AFB, AZ. The effort was partitioned into maintenance and aircrew specialty areas with AL/HRT assigned the maintenance portion and AL/HRA assigned the aircrew portion. The results would be applied to improve efficiency in squadron-level training. It was envisioned that success in this program could produce a number of benefits:

1. There would be an increased number of personnel capable of performing the unit mission.

2. There would be more affordable and effective training at the unit level.

3. Resident training at formal schools and temporary duty (TDY) costs should decrease.

4. The unit would have greater control over training which would be more specifically tailored to the unit's requirements.

Both AL/HRA and AL/HRT planned a two-phased program to provide science and technology in support of aircrew and maintenance squadron-level training (SLT). The first phase was somewhat exploratory in nature and directed toward determining the squadron's training needs. The investigation was focused on three areas: job-related training, ancillary training, and professional military education. Because such an undertaking could not include all USAF training programs, the Phase I investigation was be limited to a single weapon system. This constituted a logical first step to determine the feasibility of the approach. The plan was to expand the effort downstream if warranted by the results.

After due consideration, the F-16 was selected as the weapon system for study. There were several reasons for this choice. First, the F-16 is a mature weapon system but still a frontline tactical fighter. Second, it is projected to remain in the Air Force inventory until well into the twenty-first century. Third, it is widely deployed throughout the world so there are many geographical options for field studies. Finally, the Aircrew Training Research Division has a long history of conducting research that involves the training of F-16 pilots.

After electing the F-16 as the "test case" weapon system, the next question was "what squadrons should be studied (and where are they)?" The best answer to this question seemed to be the units attached to the Pacific Air Force (PACAF) Command. The logic behind this choice was that these PACAF squadrons were at the "tip of the spear" and represented a "worst case" situation for the application of training technology to SLT concerns. In a sense they are farthest removed from the continental United States (CONUS) schoolhouse and the logistical tail for training device support is the longest. We believed that PACAF SLT problems would be the most difficult to solve, and if a research and development solution worked there, it would probably work elsewhere.

The Aircrew Training Research Division identified four objectives for Phase I. The first, and major, objective was to identify SLT requirements for PACAF F-16 aircrews. The next objective was to match these requirements with existing division technologies. The third objective dealt with situations where a match did not exist. When deficits in the training technology repertoire were discovered, a determination was made to see if these were candidates for new research and

development activities. The fourth objective was a sequel to the second and third --define the high payoff areas for the investment of current and future laboratory resources.

In essence, the study was planned as a needs assessment of F-16 unit-level pilot training. As Kaufman and English (1979) state "Needs assessment is a tool by which one may be increasingly assured that the intervention, once selected, is related to basic gaps and problems, not just to the obvious symptoms or to problems poorly defined. It is important to assure both the planner and the society that the problem attacked is real, important, and worthy of solving." (p. 29). We believe that the present project accomplished these purposes.

This report presents the results for the aircrew portion of the project. A companion report, AL-TP-1992-0013, "Training in PACAF Maintenance Units: Final Report for Phase I of the Squadron Level Training Research Project," has been published by the Technical Training Research Division for the maintenance portion.

PROCEDURES

There are three requisitory conditions to be satisfied in the performance of a needs assessment study. First, the appropriate questions must be determined and cast into the right form. Second, these questions must be addressed to the proper subject population. Third, the resulting data must be correctly interpreted. If these activities are properly accomplished, reliable and valid findings will emerge from the investigation. To the degree that any are flawed, a distorted picture will result.

Questionnaire Development.

Two questionnaires were developed. One was used with operational aircrews and the other with command and staff personnel. Both evolved after considerable coordination and consultation with active duty Air Force officers who were extremely knowledgeable and experienced in managing operational aircrew training programs. Although other Air Force pilots and agencies were involved, the primary sources for this expert opinion were at Headquarters USAF/XOOTW, the 4444th Tactical Training Squadron (TTS) at Luke AFB AZ, and PACAF/DOOT at Hickam AFB HI. The contributions of these experts cannot be overstated as the questionnaire development proceeded through many reiterations.

Aircrew Questionnaire.

The aircrew questionnaire, titled "Squadron Level Training Survey," consisted of 30 questions that covered principal aspects of flight and other training

conducted by the squadron. The questionnaire was developed for use as an open-ended structured interview that included items focused on mission, training requirements, Formal Training Unit (FTU) preparation, methods and media, training planning and programming, evaluation, ancillary training and professional military education. Most items had several subparts requiring completion, selection of alternative responses, valuative ratings, or rankings of preferred training aids and techniques. A facsimile of the aircrew questionnaire is given in Appendix A.

Command and Staff Questionnaire.

The command and staff questionnaire, titled "Management Survey," was comprised of 16 questions designed to educe the policies and beliefs held by unit management towards flying training. As with the aircrew questionnaire, the Management Survey was designed for use as an open-ended structured interview. It covered a broad range of topics such as relation-ships/information exchange among the operational wings and squadrons performing training, joint training exercises with other services and countries, Program Objective Memorandum (POM) activities and acquisition procedures, knowledge of advances in training methods and media as well as technology transition. Appendix B contains a facsimile of the command and staff questionnaire.

Data Collection.

Data were collected on-site at all PACAF bases where F-16 aircraft were stationed. These were Osan and Kunsan Air Bases (ABs) in Korea and Misawa Air Base in Japan. At Osan, personnel from the 7th Air Force, 51st Tactical Fighter Wing (TFW) and 36th Tactical Fighter Squadron (TFS) were interviewed. Eighteen aircrew and seven management interviews were completed between 17 and 21 September 1990. At Kunsan AB, personnel from the 8th TFW, and the 35th TFS and the 80th TFS were interviewed. Forty-four aircrew and eight management interviews were completed between 24 and 28 September 1990. At Misawa AB, personnel from the 5th Air Force, 432 TFW and the 13th TFS and the 14th TFS were interviewed. Thirty-seven aircrew and five management interviews were completed between 1 and 3 October 1990. These figures sum to 99 aircrew and 20 management interviews.

Tables 1 and 2 show the demographic characteristics of the sample with regard to readiness level and assigned position. Nearly two-thirds of all the pilots assigned to the tactical fighter squadrons were interviewed. As can be seen from Tables 1 and 2, an excellent representative sample was obtained.

Table 1. Mission Readiness Level*

RANK	MQT	MRA	MRB	MRC	OTHER	TOTAL
1st Lt	6	10	12			28
Capt	1	13	30	7		51
Maj	2	3	8	1	1	15
Lt Col	1	2	2			5
TOTAL	10	28	52	8	1	99

* MQT - Mission Qualification Training
MRA - Mission Readiness, Level A
MRB - Mission Readiness, Level B
MRC - Mission Readiness, Level C

Table 2. Position Assignment

RANK	WGMN	FL LD	IP	OTHER	TOTAL
1st Lt	26	2			28
Capt	20	13	16	2	51
Maj	2	4	9		15
Lt Col	1	1	3		5
TOTAL	49	20	28	2	99

* WGMN - Wingman
FL LD - Flight Lead
IP - Instructor Pilot

The aircrew survey was designed for, and most were performed using, groups of two pilots each. Occasionally, only one subject could be scheduled and there were a few instances where groups of three pilots were used. All interviews were conducted by a two-man team composed of a fighter pilot and a research psychologist. By allowing the subjects to talk "pilotese" to another pilot, rapport was enhanced and uncertainties in meaning could be clarified on the spot. Questions were asked by the research pilot following the questionnaire format. As verbal responses were given by squadron pilots, they were recorded/annotated by

the research psychologists on a blank copy of the questionnaire. The management interviews were usually accomplished by a single researcher working one-on-one although a few were performed by two researchers with two subjects.

As mentioned above, the interview was based on an open-ended, unconstrained response format, but the actual protocol followed for aircrews was structured in several respects. First, a setting was arranged where the interview could be conducted without interruption. Second, if more than one subject was being interviewed, the groups were "matched" in terms of rank and operational flight experience. That is, a first lieutenant with 300 h was never paired with a senior captain or major with 1500-plus h. This was done to preclude the possibility that the "old head" would dominate the discussions. Third, the interviews were not allowed to drag out or stray from the point. This kept the time demands on the aircrews to a minimum. Nearly all interviews were completed within 1 h and none exceeded 1 h and 15 min. Management interviews were completed within 30 to 45 min.

Data Analysis.

Two methods were employed to analyze the data. The major technique relied upon was content analysis. In fact, this method was used exclusively for the management interviews. Because rating scales were used by the interviewers much of the aircrew data were quantitative in nature and could be analyzed using descriptive and inferential statistics.

FINDINGS

The two survey instruments had very different (but complementary) objectives; therefore, the results of each will be discussed in separate sections. Following the order of presentation that has been established, the aircrew portion will be first.

Aircrew Survey Results. As stated, 99 PACAF operational F-16 pilots were interviewed using the questionnaire.

Question 1. The first question in the aircrew survey was for classification purposes and dealt with the degree of mission qualification possessed by the pilot. This information has been presented in the Tables 1 and 2. The remainder of this subsection will list the items in the questionnaire in their order of appearance and the findings that resulted.

Question 2. Other than Desired Operating Capability (DOC) mission, what special missions do you currently train in? Does training for special missions have any impact on your primary mission performance (good or bad)?

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Question 2. Other than Desired Operating Capability (DOC) mission, what special missions do you currently train in? Does training for special missions have any impact on your primary mission performance (good or bad)?

For the overwhelming majority of the pilots sampled, the primary mission was close air support (approximately 82%). This was followed by precision-guided munitions (11%), low altitude night terrain infrared navigation (LANTIRN) (4%), and joint operations (3%). A 58.5% of the sample trained for what they considered to be special missions. Of this group, 40% trained in joint operations, 35% in precision-guided munitions, 20% in maritime operations and 5% in LANTIRN. When asked if the training for special missions had any impact on their primary mission performance, two-thirds of the pilots replied that it did not. Of the one-third that answered "yes," 14% felt that the affect was positive because more sorties were generated and general flying proficiency was increased as a result. Most of the pilots (86%) who believed that training for special missions had an impact on their primary mission felt it was harmful. The most frequent reasons given were that it reduced DOC training time and produced a "jack-of-all-trades, master-of-none" syndrome.

Question 3. Multi-Command Manual (MCM) 51-50, defines the levels and prerequisites of mission ready (MR) status: Beyond the 51-50 Manual, is there any other "driver" of your unit training program? What aspects of your mission need more emphasis or better training?

If the wing/unit training plan is included with the training requirements of MCM 51-50, there are really only two other "drivers" of the unit training program. These are exercises and deployments, and upgrade training. Approximately 31% of the respondents listed the former and 18% listed the latter. Although several other factors were mentioned (e.g., local operational readiness inspections), none accounted for more than a very small percentage of the responses.

When queried as to what aspects of the mission needed more emphasis or better training, 43% answered "increased air-to-air combat." Twenty-five percent gave the closely related response of "more multiship and dissimilar aircraft" training. Eight percent of the pilots specified radar air intercepts. Thirteen percent wanted more electronic combat/warfare training. Finally, 10% suggested that more training in weapons delivery (with suitable ranges) would be beneficial.

The weight placed on air-to-air combat and dissimilar aircraft training was disproportionately allocated when squadron location is considered. These two tasks constituted the vast majority of responses at Kunsan AB. At Osan and Misawa ABs, however, they were much less heavily emphasized.

Question 4. Who manages your current training program?

The manager of the individual pilot's training program was invariably a captain or major who was a flight commander.

Question 5. Considering the process of attaining/maintaining MR status from a training and skills development/maintenance standpoint (not weather, etc): What is the most difficult aspect of attaining MR? What is the most difficult aspect of maintaining MR? Are these difficulties affected by a lack of training aids?

Question 5 was directed toward determining what was hardest to learn and what was hardest to retain enroute to reaching MR status. For the entire sample, the most difficult tasks/skills to learn were, in order of harder to easier, weapons delivery, radar interpretation, electronic combat, cockpit switchology, and air-to-air combat. The responses of instructor pilots to this question were more diverse, but they did concur that weapons delivery and switchology were difficult tasks to learn.

When the question of what mission-ready skill is most difficult to maintain is asked, a different picture emerges. Air-to-air combat (including dissimilar aircraft) is hardest, followed by weapons delivery and radar interpretation. The answers given by instructor pilots are in complete agreement with those of the entire sample.

Only 24% of the sample stated that the lack of training aids caused difficulties in either attaining or maintaining mission readiness. Unfortunately, it cannot be ascertained if this finding is due to a limitation in training aid capabilities, or a lack of knowledge of the existence of such devices.

Question 6. Rate the Mission Qualification Training (MQT) program in your unit.

Question 6 had five parts. It was designed to measure the perceived merit of the inflight and ground portions of the squadron's Mission Qualification Training. Both portions were rated using a 4-point scale consisting of the categories marginal (1); adequate (2); good (3); and, very good (4). Inspection of the data suggested that squadron-unique factors such as duration of assignment and mission (i.e., DOC and special taskings) influenced the evaluation of this training. Statistical analyses using chi-square confirmed this finding.

The duration of assignment to PACAF F-16 squadrons is either short (one year) or long (three years). The median rating of inflight MQT was between adequate and good as assessed by pilots serving a short tour. For pilots serving a long tour, the median rating was between good and very good. This rating difference was significant beyond the .01 level ($X^2 = 21.88$, df = 3).

Three areas were identified as primary or specialized missions of the PACAF F-16 squadrons. These were classified as LANTIRN, nuclear, and close air support. The rating of inflight MQT differs significantly as a function of squadron mission. The median rating assigned MQT by the LANTIRN mission squadron was between

adequate and good; for the nuclear mission squadron, it was adequate, and for the close air support mission squadrons, it was good (X^2 = 15.31, df = 2).

Those pilots who rated inflight MQT marginal or adequate did not agree as to the reasons for the ratings assigned. Forty-five percent believed the cause was due to internal deficiencies (within squadron control) while 55% felt that external deficiencies (outside squadron control) were responsible.

The results of the analysis of the ground training portion of MQT corresponded to those of the inflight 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. This rating difference was significant at the .05 level (X^2 = 3.90, df = 1). 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. Again, the difference is significant at the .05 level (X^2 = 6.00, df = 2).

Fifty-three percent of the pilots rated the ground training portion of MQT as either marginal or adequate, and there was strong agreement that this was due to internal deficiencies (78% so saying). Forty-four percent said there were areas of ground training that needed more emphasis. The four most mentioned areas, in order of identification from most to least, were electronic combat, weapons/ weapons delivery, mission planning, and switchology.

The fifth part of Question 6 dealt with areas of MQT ground training that needed improved training aids or media. Thirty-five percent of interviewees responded to this question. Of these, 63% singled out the training in electronic combat/threat recognition as requiring better training devices. Seventeen percent named switchology as an area, while 10% suggested a Weapons System Trainer (WST) simulator, and another 10% suggested video tape recorder (VTR) improvement.

Question 7. Rate your Flight Lead Upgrade training program (if applicable).

As with Question 6, this was a multipart question. One-third (N = 33) of the pilots interviewed had undergone Flight Lead Upgrade training. The average individual rated the inflight portion of the program as "good" with little variance about this point. For the few pilots (15%) who assigned an "adequate" rating, there was no agreement as to whether the cause was internal or external. Sixty-seven percent did not feel that any areas of inflight training needed more emphasis. Of those pilots who felt there were shortfalls, 46% wanted more air combat, 27% wanted multiship training, and 27% thought that the management of training should be improved.

Operational Readiness Inspections are listed well below these with exercises and checkrides also receiving some mention.

Question 12. Does your unit evaluate exercise results?

Seventy-eight percent of the respondents stated that the squadron did have a systematic process for evaluating exercise results. The personnel who performed this function were wing weapons shop people and/or standardization/evaluation types. In many instances, the Director of Operations (DO) conducts a review of their findings.

Question 13. In the time between FTU/IQT (Initial Qualification Test) and unit MQT/MR, did you experience any skill or knowledge loss?

Question 13 was intended to determine if pilots experienced significant loss in piloting skills between the time of their departure from schoolhouse training and the time of their arrival at their operational squadron assignments in PACAF. The time lapse can be up to about two months due to additional training such as survival school, annual leave, and travel time between units. During this period, the pilot does not fly the F-16 and any skill lost in the interim, obviously, must be absorbed by the gaining unit.

The question was posed in two parts. The first part asked if the pilot experienced any skill or knowledge loss during the time period and if so, to identify or describe the skills. The second part was a follow-on for yes responses to the first part. Those answering yes were asked if the degree of loss was important enough to warrant the development of methods or devices as a means of preventing or overcoming loss of skills. The results are tabulated in Table 3.

Responses to question 13 show that roughly two-thirds of all pilots interviewed perceived a significant loss of knowledge/skill during the interim between completion of schoolhouse training and entry into the operational unit. Of pilots in remote assignments in Korea, those at the 35th TFS at Osan AB gave the highest percent (84%) of yes answers concerning the skill loss question. The Korea-based squadrons collectively indicated a slightly higher percentage of yes responses, compared to the squadrons at Misawa AB. The big difference, and perhaps the most significant, was on the second part of the question. Approximately 70% of the pilots responding to the question in the Korea squadrons indicated that additional training was needed to rectify skill loss. Of the Osan AB group, 88% responded in favor of additional training. Pilots at Misawa AB, although they concurred with those in Korea about the intervening skill loss, did not feel the loss was significant enough to warrant additional training measures. Only 24% of the Misawa-based pilots indicating significant skill loss felt that additional training was necessary. Typical responses from many in Misawa AB were to the effect that the lag time does cause some "rustiness" but this is easily overcome with a few "rides" in the aircraft.

Table 3. Skill Loss Response Percentages

UNIT	PART 1		PART 2
	Yes	No	Yes
36th TFS	84%	16%	88%
35th TFS	55%	45%	78%
80th TFS	63%	37%	33%
13th TFS	60%	40%	22%
14th TFS	67%	33%	25%
Korea Sqdrns	67%	33%	70%
Japan Sqdrns	64%	36%	24%

This finding is consistent with responses to other questionnaire items and general impressions gained by AL/HRA personnel during interviews with pilots in the PACAF squadrons. In Korea, and particularly at Osan AB, although mission readiness requirements are the same as for Japan, there is considerably more pressure from training requirements simply because of the constraints imposed by the 12-month tour. Thus, skill decrements prior to arrival at the gaining unit appear to be more keenly felt by Korea-based F-16 pilots than in the Misawa squadrons.

Question 14. What percentage of your unit's ground training is done in a briefing room environment?

This was a multipart question, the first part of which asked pilots to estimate the percentage of their unit's ground training done in a briefing room environment, that is, group sessions or structured lecture situations. Pilots indicated on average that 80% of their ground training was conducted in this type of environment.

The next part of the question asked pilots to estimate frequency of use of the methods of instruction employed in the briefing room environment.

Eighty-three percent of the pilots indicated that the briefing is the predominant method used in the ground training environment with discussion/ seminar a distant second (17%). All pilots responding to this item ranked either discussion/seminar or briefings as 1 or 2 in preference of presentation mode.

The third part of the question asked pilots to rank in order of predominance of use, various media employed for ground training. Media ranked were boards/models, slides (overhead transparencies), TV (video tapes) and handouts. Table 4 lists the rankings obtained.

Table 4. Percentage of Rankings by Pilots Across Media Types

Ranking	Bds/Models	Slides	TV	Handouts
1	24	78	1	0
2	70	17	7	18
3	6	5	54	38
4	0	0	38	44
	100%	100%	100%	100%

Pilots reported that slides, that is, overhead transparencies, were the most used medium for ground training. This is consistent with the predominance of the briefing as a method of training. Thus, it appears that most ground training is done via briefings supported by overhead transparencies. Next, in order of use, were boards and models. Fifty-four percent of the pilots ranking TV (video tape) indicated it was the third most used medium for ground training. Finally, 44% ranked handouts as least used.

In the next part of Question 14, pilots were asked to indicate which media they preferred. Media preferences are given in Table 5.

The last part of the question asked pilots to indicate if, in their opinion, ground training could be improved in their squadrons. To this question, 66% of the responding pilots said yes, while 34% said no.

Table 5. Media Type

Type of Media	Preference by Percentage of Responding Pilots
Slides	31
TV	27
Boards/Models	21
Handouts	13
Other	8
	100

Question 15. Does the squadron use a systematic approach in developing instruction for your ground training? Does the squadron receive any help/guidance from the wing or other headquarters?

If the answer to this question was yes, pilots were asked to describe the approach. Systematic instruction in this context refers to formal design of instruction such as instructional systems development (ISD) procedures, as explained to pilots being interviewed about this question. Eighty-two percent of the pilots answered "no," while only 18% said "yes." Those answering yes indicated in most cases that although ISD procedural materials were available, they were not followed rigorously because in few cases were any squadron personnel familiar enough with ISD to be able to apply it. However, those answering yes felt that some significant attempts to systematize instruction were being made in their squadrons.

The next part of Question 15 asked if the squadron was receiving any help or guidance on instructional development from the wing or higher headquarters level. Twelve percent of those responding to this question gave a yes answer; 88% said no.

It is clear from the responses that systematic approaches to instruction (in the sense of ISD practices) are not part of the training development activities of the PACAF F-16 squadrons. A typical comment heard from pilots was to the effect that they receive assignments to prepare a unit of instruction on a specific subject in which they may have some expertise. Typically, they then "work up" a lesson plan with an outline, and perhaps some slides, which can be used to present the material to pilots in their squadrons. They can request assistance from the wing for advice on lesson content and help with some media production, but there is typically no expertise available on how to design the instruction; that is, how to develop objectives and tests, sequence training, measure and evaluate results, etc.

Question 16. Rate the adequacy of the ground training for selected aircraft systems.

This question asked pilots to rate the degree of adequacy of ground training in their squadrons for training the operation of several major subsystems of the aircraft. The scale used for ratings was:

0 - Not available
1 - Marginal
2 - Adequate
3 - Good
4 - Very good.

The average rating obtained from pilots interviewed is presented in Table 6.

Pilots rated ground training for all systems somewhere between 2 (adequate) and 3 (good). Average ratings for the head up display (HUD) and weapons systems tended toward "good" while Fire Control Radar (FCR), Fire Control Computer (FCC), and RHAW training tended toward "adequate."

Table 6. Ground Training Ratings

Aircraft System	Average Rating
FCR (MFD - Multifunction Display)	2.32
RHAW/ECM (Radar Homing and Warning/ Electronic Countermeasures)	2.37
FCC	2.43
HUD	2.59
Weapons	2.73

Question 17. What percentage of ground training is done by the trainee on his own? Are instructional aids which can be used outside the squadron (other than training manuals) available?

The average estimated time reported by pilots was 50.8%. But responses varied greatly across the sample. The range of estimates was from 0% to 95%.

Ninety-three percent of those responding to this question indicated no training materials/aids were available for outside-the-squadron use. Seven percent stated there were such materials which included the wing "playbook" and videotapes.

Overall, it appears the average pilot spends about half of his ground training in the self-taught mode and, for the most part, without availability of materials or media that can be used outside the squadron environment. Anecdotal evidence suggested that a considerable amount of time is spent by pilots [especially those new to the squadron] reading classified materials in the squadron documents vault.

Question 18. Estimate the amount of time you spend per week in informal/ peer-based training situations such as "war stories" and informal group sessions discussing mission-related topics (i.e., weapons employment).

The average estimate of the time spent in informal types of activities was 4.62 h per pilot per week. But there was considerable variance among individual estimates, which ranged from zero h by five pilots to as high as 40 h by one pilot.

There is little doubt that time spent in "war stories," "hand flying," and "bar talk" discussions accounts for a significant and important activity among pilots. The amount of time devoted to such activities may be somewhat greater in remote assignments in Korea rather than in Japan because of the social situation of personnel.

Question 19. Estimate how much of your ground training is conducted using these methods (i.e., knowledge tests or class/lesson sessions).

The average estimated percentage of time devoted to knowledge testing was 21% of ground training content with 79% being class/lesson sessions. (Knowledge testing was defined as being questioned/tested on a subject and being passed/excused from further training if a sufficiently high score was achieved.)

Question 20. How effective are ground training resources in your unit?

For purposes of analysis, the information produced by Question 20 is contained in the answers to its three subparts.

The first part (A) asked which media was/were most used in mission-related ground training. Based on percentage of use, the order is as follows:

1. Videotape recordings	33%
2. Subject matter expert	16%
3. Briefings	15%
4. Simulator	14%
5. Slides	8%
6. Regulations/manuals	4%
7. Audiovisual aids	2%
8. Mockups	2%
9. Computer-assisted instruction	0%
10. Part-task trainers	0%

The second part of this question asked which [media] would you like to see used more?

Answers in order of preference, by percentage of those who responded to the question, are as follows:

1. Simulator	30%
2. Subject matter expert	21%
3. Videotape recordings	17%
4. Computer-assisted instruction	11%
5. Mockups	7%

6. Part-task trainers	6%
7. Audio-visual aids	6%
8. Regulations/manuals	1%
9. Slides	1%
10. Briefings	0%

The third part inquired if there is any particular type of ground training that suffers significantly from lack of effective training aids/media? If so, what area(s)? Seventy percent of the pilots responded that there were no deficient areas. Of the 30% responding yes to the above question, many also indicated areas of training where training media improvements were needed. In order of areas most frequently mentioned, the top ten are as follows:

1. ECM
2. Threat recognition/knowledge
3. Emergency procedures
4. Radar/Radar warning receiver (RWR)
5. Air intercepts
6. Automatic Identification Friend or Foe (IFF)
7. Rules of engagement (ROE)
8. Life support systems
9. Digital radar landmass simulation (DRLMS)
10. Avionics management

Question 20 is essentially a media preference question. Parts A and B attempt to identify which media pilots actually use and/or would prefer to use for ground training purposes. Part C is a little more specific; it attempts to identify areas of training which are not adequately supported by media resources.

The overall impression from the responses to Question 20 is that PACAF F-16 pilots are none too enamored of any ground training media. The tally of the part A question showed that videotape was the most used medium (33% of respondents). Next were subject-matter experts (16%) and briefings (15%). The use of all three of the above media is related as subject matter experts use videotapes to debrief aircraft missions. Apparently, this form of ground training is perceived as an effective method. This preference may be in part because aircraft camera videos may provide a close enough analog to the aircraft experience to enable discussions about decision making and combat tactics.

Next in order of actual use was the simulator (in this case the operational flight trainer) with 14%. However, the part B responses do identify the simulator as the medium which pilots would most like to see used more. In this regard, the data may not fully reflect subjective impressions AL/HRA investigators obtained about the new operational flight trainers (OFTs) at the squadrons. These simulators had been on-site

a relatively short time, but seem to have been very well received, judging from most comments. At Osan AB, the simulator facility was not yet operational at the time of the interviews, which may account in part for the rather modest showing the simulator rating (as a training medium) on this question. All reports indicated the new OFTs at Kunsan AB and Misawa AB have thus far been highly successful.

Question 21. Regarding ground training, what would you say is the primary cause of problems?

Of the pilots responding to this question, 63% said that the problem was in the administration of training. That is, the information needs to be taught in a better way. Twenty-seven percent thought the problem lay in the content of the training material. Those holding this opinion believed that too much time was wasted learning unimportant information and skills. Ten percent had no opinion.

Question 22. What are the problems/hindrances to effective training management in your squadron (if any)?

The most frequent response to this question (30 responses) had to do with undermanning and overtasking. Despite 10-12 hour work days, the pilots often felt they had too much to do and too little time to do it. The conversion process of upgrading from one type of F-16 aircraft to another was mentioned by 10 pilots which indicates upgrading is part of the heavy workload. The turnover rate of pilots in the squadrons was cited as a problem (11 responses), especially by those pilots at Kunsan AB. Finally, a number of responses (12) indicated the training process was hampered by a lack of quality management and the scheduling tools necessary to get the most out of each day. One might surmise that better planning, management, and scheduling tools might reduce the pilots' feeling that they are overtasked.

Table 7. Number of Responses per Problem.

1. Undermanned (overtasked) (not enough time)	- 30
2. Lack of quality management/scheduling tools (AFORMS - Air Force Operations Resource Management System problems)	- 12
3. Turnover rate (continuity)	- 11
4. Conversion process (upgrades)	- 10
5. Weather	- 6
6. Lack of knowledge/expertise (not enough IPs)	- 5
7. Syllabus problems	- 4
8. MCM 51-50 overheads	- 3
9. Resource limitations	- 3
10. Unknown, no problems	- 15

Question 23. Besides logging MCM 51-50 requirements and currency "squares," is training data collected and analyzed? If yes, describe.

Of the 44 who responded to this question, 22 said "yes" and 22 said "no." We could detect no difference in response rate between ranks, flight hours, or squadrons. This leads us to conclude that the pilots have no agreed-upon definition of training data. Some believe it is collected and analyzed and some do not. A difference in definitions is most likely the cause of this divided response.

For those pilots who responded "yes," there were a number of descriptions of the type of training data collection and analysis system they had in mind. Following are their most frequent responses:

1. HUD videotape recorder assessment
2. Weapons shop evaluations
3. Exercises (Top Gun, Turkey Shoots, etc.)
4. Weapons delivery tracking and reviews

These responses did not indicate a coordinated, systematic use of these data collection and analysis tools.

Question 23A. Do you use AFORMS information for other than tracking MCM 51-50 progress? If yes, describe.

Of the 44 pilots who answered this question, all said "no."

Question 23B. Is your unit flying and ground training tracked by computer?

Twenty-six percent said "yes" and 18% said "no." The fact that some respondents in each unit answered that automatic tracking occurs and others answered that it does not, indicates a lack of standard definition of what computer tracking is and how it can be used.

Question 23C. Beyond standardization/evaluation (Stan/Eval) and inspector general (IG) evaluations of your training records, is there any evaluation done of the unit's training processes and effectiveness?

Only 6% of the sample said "yes," 39% said "no." The units do not typically have training experts familiar with evaluation techniques who would provide feedback about how best to improve existing training based upon training records. In addition, time constraints may make it difficult for units to make these analyses. We recommended the units and PACAF make a strong effort to use training records for more than Stan/Eval and IG evaluations. Where extra help is required, we suggest using an internal Air Force organization, such as a laboratory or Air Training Command (ATC).

Question 24. Is any training planning (beyond scheduling and tracking of MCM 51-50) done at your unit? If yes, describe.

Twenty percent responded affirmatively, 24% negatively. Of the respondents who indicated their units had a training plan other than MCM 51-50, 55% mentioned that the unit had a six-month plan. MCM 51-50 is helpful as a planning tool but it should not be the sole planning document. It merely prescribes events that should occur, and loosely describes standards that should be applied. It does not prescribe the types of learning outcomes that will occur from those events, nor does it indicate what remedial actions should be taken if a pilot fails to meet the standard. It prescribes the "what to do" but not the "how to do it."

Question 24A. Is training planning monitored/evaluated for effectiveness?

Whereas 36% of the pilots said "no," only 9% said "yes." It is somewhat disappointing that this question did not elicit more affirmative answers. Good training planning is at the core of a good training program. If the plan is not revisited on a frequent basis to determine if it is effective, then it is difficult to see how the training program will improve. Of the nine positive responses, all involved Local Operational Readiness Inspection (LORI) activities and less than half were from senior officers.

Question 24B. If yes above, have there been any training changes made as a result of this planning evaluation?

There were no responses to this question.

Question 25. How would you improve your ground training program?

The five most frequently encountered responses to this question were:

1. Make better use of training technology methods/media (more/better quality videos, part-task trainers (PTTs), simulators, computer-based interactive training system (CBITS), VTR tape) (28%)
2. Systematic instruction (including a better syllabus) (11%)
3. Better training management (6%)
4. Make more efficient use of training time and training preparation time (5%)
5. More/better electronic countermeasures training (4%)

By far, the most frequent response to this question related to new/improved/ more media for training. Most of the pilots had access to fairly sophisticated training technology at some earlier part of their careers and they recognized that technology could be helpful in meeting their current training requirements. There was also a recognition that the syllabi needed to be more systematically developed. Part of the problem may relate to the earlier finding that training planning should be improved. When the training planning has not been systematically developed, one is not surprised to find that the training syllabus is not systematic.

Question 26. How would you improve your flying training program?

The top ten responses to this question were:

1.	Reduce taskings	(9%)
2.	Better training management/tracking	(9%)
3.	More/better Defense Air Combat Tactics (DACT)	(8%)
4.	More flying hours	(8%)
5.	More/better ACBT	(7%)
6.	More range/airspace	(5%)
7.	More multiship tactical training	(3%)
8.	Reduce higher headquarters fliers	(2%)
9.	Reduce amount of upgrades	(2%)
10.	More time for CT	(2%)

The two first-place responses in this category (reduce taskings, and better training management system) are related. A better training management system would likely provide more taskings because the time would be more efficiently spent. It is often the case that it is not the number of taskings that is the real problem, but rather the feeling that there is not enough time to perform all the tasks that have been assigned.

More/better DACT, more/better ACBT, more flying time, more range/air space, more multiship training, are needs that all can be addressed by simulation training. While there is nothing that replaces actual flight training against other aircraft, simulation can go a long way to provide crucial practice against various aircraft and

over different types of ranges. As the cost of simulation continues to decline dramatically, PACAF, Tactical Air Forces (TAF) and the Air Force should look for ways to place affordable simulation at the unit level.

Question 27. Estimate the percentage selected ancillary training methodologies are used.

The estimated ancillary training methodologies percentages are given in Table 8.

Table 8. Ancillary Training Methods

Type of Method	Percent
Knowledge Test	14
Read File/Sign Off	51
Class Brief	35

While "read file/sign off" had the largest response to this question, the standard deviations were very large for all three methods. This indicates a wide variance from unit to unit and from individual to individual in the way that ancillary training is administered. The methods that were cited most often, "read file/sign off" and "class brief" have been shown many times to be fairly ineffective methods in terms of both acquisition and retention of knowledge. It might be helpful to test computer-based methods of delivering this training in order to determine if it would be more effective than the present approaches.

Question 27A. How would you rate the training effectiveness of the ratio in Question 27?

The typical response to this question was "adequate" or slightly above which gives some indication of how pilots regard ancillary training. Even though it is quite likely that these methods of training are not very effective, pilots still felt that the methods were probably good enough. They view ancillary training as an activity that has to be "suffered through." A number of respondents indicated that they were not sure what ancillary training did for them but since it was mandatory they got through it as painlessly as possible. Again, a more interesting form of ancillary training (e.g., computer-based media) might help to make the training itself more engrossing.

Question 27B. If training is rated marginal, how/what would you change?

Answers included more briefings, better media, use read file/sign off entirely, eliminate briefings, allow more time, require less reading. It might help to make more effort to inform the pilots about how ancillary training will aid them in their Air Force jobs.

Question 27C. Could this training be enhanced?

Forty-one percent of the pilots who responded to this question answered "yes." However, since a large percentage of pilots currently view ancillary training topics without much enthusiasm, even the relatively ineffective training methods presently in use seem to be good enough.

Question 28. Compared to other mission-related ground training, do you consider ancillary training: (1) equal to other ground training; (2) less important, but worthwhile; (3) much less important.

Of the 79 pilots who responded, 1 said it was equal, 29 rated it less important but worthwhile, and 49 thought it was much less important. It is encouraging to note that over one-third of the pilots see some value to ancillary training. The editorial comments above address ways that might make it more meaningful for the other 62%.

Question 29. What, if any, formal Professional Military Education (PME) have you done?

Of the pilots sampled, 14 reported attending Squadron Officer School, 17 said Air Command and Staff College and one had been to Air War College. Of those that had no PME, the reason given was that it was "not required." The overwhelming method of accomplishing PME was through correspondence courses although a sizable minority of pilots had been involved in seminars. Most said that more interactive/better media would improve unit-level PME.

It is interesting to note that almost all of the responses about ways to improve unit-level PME center on the way it is delivered and not on the content. This sample is too small to conclude that the content is satisfactory, but it does give some indication that it is satisfactory. It might be helpful to conduct a follow-up study of PME graduates to determine how the PME content has helped them in their jobs.

Question 30. On the basis of what we have told you, where and how do you think AL/HRA can be of most help to you?

Thirty-five percent of the pilots requested more/better media (computer-based training (CBT), PTTs, training videos, simulators, audio tape, instructional games). Another 10% specifically cited the need for more/better simulators.

Management Survey Results. Twenty command and staff personnel at the operational units were interviewed using this questionnaire. Of this number, 30% were ranked as 0-6s and 70% were 0-5s.

Question 1. Other than FTU, what relations does your unit maintain with the Tactical Air Command (TAC) (presently known as the Air Combat Command (ACC), but for purposes of survey integrity, will continue using the name TAC in this report), for pilot training? With ATC? HQ PACAF? Other USAF and foreign commands?

The PACAF wings evaluate the FTU product (routine quality control check) and attend an annual training conference, but otherwise there is no contact with TAC. There are absolutely no formal relations with ATC. As regards PACAF, the wings are involved in an annual discussion of training regulations and work these in a coordination process. The closest association between PACAF and the wings has to do with Stan/Eval procedures and check rides. The wings are involved in planning for exercises (not operational training) with other services and foreign commands--Team Spirit and Cope Thunder are examples. However, Misawa-based pilots conduct air-to-air and air-to-surface exercises with Japanese Self-Defense Forces (JSDF) and meet with them monthly to plan these events.

Question 2. Should additional relationships be established with other agencies such as TAC, ATC, Air Staff, and HQ PACAF to assist your unit in enhancing training?

The answer in the majority was "no!" It was felt that the "plate was too full" and additional contacts would only "muddy the water." Actually, conduits do exist, but may need to widened if closer relationships are desired. The purpose and result would be to teach commanders to use technology. At Misawa AB, there is an awareness of this need and they do work with the Self-Defense Force.

Question 3. Are you able to obtain the resources you need to support your training requirements? If not, why and what is the result?

Yes, but sometimes difficult to obtain. One or two answered "inadequate." Misawa-based pilots think they are pretty well off.

Question 4. What training/exercises do you perform with other services/ countries? Are they effective? Why or why not?

Team Spirit (US Navy), Cope Thunder and Cope Fog were listed. In Korea, Kunsan and Osan-based pilots work with the Koreans primarily in close air support.

Misawa-based pilots perform a lot of Defense Air Combat Tactics with the JSDF. All wings report these activities as being good, needing more of them, and being quite effective. However, in both Japan and Korea, language difficulties are a severe impediment to working together.

Question 5. Are there any current initiatives for training development and/or evaluation in your unit? Do they work?

In sum, the answer is "no." Following the TAC tradition, the wings have a narrow focus on training (also impacted by short tours and heavy training loads). However, in all wings, the training syllabus is always being reworked. For the 36th Tactical Fighter Squadron, the LANTIRN requirement was new.

Question 6. How do you provide POM inputs to HQ PACAF? How often do your POM requests make it into the Congressional budget?

The wings do not make POM inputs. They replied that POM considerations are at TAF and PACAF levels.

Question 7. What do you need to improve the training process in your unit?

This question was answered at many levels. Items of a general nature included removing "junk" duties, reducing ancillary training, and modernizing training methods. A quality FTU product with a standardized skill and knowledge base was mentioned. Specifics included such items as a good range and airspace in Korea, a full mission simulator at all air bases, and giving instructor pilots dedicated time to training students. Specific skill areas (and devices) where training needs improvement were:

1. Electronic warfare (countermeasures, threat, recon, etc.)
2. Air intercepts (multiship)
3. Aircraft systems/switchology (weapons, avionics, etc.)
4. Air-to-air and DACT
5. Radar interpretation
6. Precision-guided munitions (PGM) training
7. Area navigation
8. Mission rehearsal

Question 8. How is the training process evaluated in your unit? By whom? What criteria do they use?

In general, the wing training plan is followed. Eighty percent of the training is tightly controlled by Stan/Eval. The squadron commander and flight commander set goals and see that they are achieved. On a daily basis, the IPs perform evaluations.

Question 9. Is there clear training policy and guidance from Wing HQ? HQ PACAF?

Wing direction to squadrons is clear cut but also allows enough latitude for the squadron to function as it should. PACAF guidance is "okay," but 51-50 may be too much. Perhaps 51-50 should be reviewed and updated as new aircraft models become operational.

Question 10. In view of current and probable future cuts in resources, what aspects of existing training programs will require restructuring and/or redevelopment?

Actually, assignment policies may have to change. Time to "real" MR will lengthen, perhaps by 6 to 8 weeks. Flight lead and IP programs will stay much the same. It was universally agreed that more air-to-surface training would be (and is) needed. A more descriptive (candid) assessment of the pilots' capabilities from the FTU is desirable.

Question 11. What new training needs (or shortfalls in skills and knowledges) will result from the reduction of flying hours in the FTU syllabus and the planned loss of Lead-In Fighter Training (LIFT)?

The young pilot will have less "air sense" (e.g., situational awareness). There will be a slower learning curve in the operational squadron. The pilot will not have an "experience bag." Specifically, knowledge of aircraft systems and ability to fly the HUD will be most affected. "Mid-level" ability FTU products might suffer most and cause the greatest problems in the squadron.

Question 12. How generalizable will the results of the present survey be to the USAF F-16 community and to the rest of PACAF? To the TAF?

Opinions on generalizability were most varied. They ranged from "absolutely" to "probably not." It was often mentioned that all the tactical Air Force "sees the same problems." However, specific weapons and operational plans are unit unique.

Question 13. If AL/HRA brought you an effective training product or innovation, what would you do with it?

a. What conditions concerning its use would apply?

Must be a "turnkey" operation. Must address and solve a real training need. Must be user friendly as well as reliable, maintainable, and supportable. Needs a short logistics tail. Should be owned by the squadron. Must fit in available space. Should be challenging and "fun" to operate.

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

Must have means of training operators (i.e., instructors).

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

Operations and Stan/Eval personnel.

d. Would the innovation be more likely to be used if your unit developed it cooperatively with AL/HRA?

Yes, but can't afford to send a squadron pilot to the continental United States (CONUS) to serve as subject-matter expert (SME). Operational inputs are vital, however. This dilemma might be resolved by using Luke AFB personnel very recently returned from PACAF.

The usual response to the main question was "I would test it for our unit's use and put it in my training plan."

Question 14. How would you assess the value of the embedded training concept for use in operational environments?

Answers to this question tended toward a dichotomy.

a. Positive. This is a good concept and would make Air Combat Maneuvering Instrumentation (ACMI) obsolete. Would prefer dedicated system, but this would hurt squadron's resources. Sounds like a great idea.

b. Negative. One hundred percent against it. If something "beeps" in an operational weapons system, it must be real. A waste of time and money. Don't like as a training solution: the simulator can handle the problem.

Question 15. Are your training officers and IPs conversant with current training technology concepts and instructional methods?

a. Do you think it is important that they have an understanding of those methods and concepts?

Not really. Overkill. Only 50% would use.

b. If AL/HRA developed a convenient, user-friendly approach to keep your training officers and IPs current in such methods and concepts, would they use the AL/HRA product? Would you insist they use it?

Yes, if "hands-on." Simple "how-to-do-it" package might be helpful.

The general answer was "no." There is a wide variance in the methods used to teach. The squadrons do not use formal ISD procedures (but one or two individuals claimed awareness and use).

Question 16. Would you have an interest in establishing a working relationship with the Air Force Systems Command (AFSC) Human Systems Division (HSD) for continuing training R&D and technology transition?

Yes, it would be an avenue to get new ideas to the wing. Most would strongly support if HSD would pay TDY expenses. But again, making SMEs available at Williams AFB AZ would be difficult for Osan and Kunsan squadrons.

DISCUSSION

It soon became apparent that there were two very different avenues which could lead to the solution of unit-level training problems in PACAF. These may be identified as assignment policy solutions and training system solutions.

Assignment Policy.

Although these considerations fall technically outside the scope of squadron-level training initiatives, they warrant mention. There are three ways that changes in assignment policies could alleviate difficulties in the training of PACAF F-16 pilots. First, by assigning only pilots with prior operational experience who were once MR, training requirements immediately would be reduced to a more manageable level. Second, following US Marine and Navy practices, whole F-16 squadrons could be deployed and rotated rather than individual pilots. Third, for Osan AB and Kunsan AB squadrons, the tour of duty could be accompanied and lengthened to the normal three-year duration. Although these approaches are feasible and would minimize the training burden, it is realized that Air Force personnel policies are "poured in concrete" and are unlikely to change.

Training Systems.

The training system solutions fall into two categories. These may be labeled as device/software solutions and courseware/software solutions. The device/soft-ware approach could be applied to ground training for electronic warfare, weapons delivery, radar intercepts (basic and multiship), and switchology. Devices currently under development at AL/HRA, the Air Intercept Trainer and the Multitask Trainer, would help satisfy PACAF training requirements in these areas. Training courseware/soft-ware solutions could be found in CBITS applications for many aspects of electronic warfare and F-16 switchology.

SLT Initiatives.

There are several lines of possible future activities that could be pursued in squadron-level training. At a minimum, consulting services in simulation engineering, software enhancements, and advanced training technology could be provided. There are at least two research and development activities that hold promise. One of these is prototyping and evaluating part-task training devices for use in remote locations. In conjunction with this, but also as a stand-alone effort, would be cost/benefit and training effectiveness studies.

Air Force Implications.

Although the focus of the survey was on F-16 aircrew SLT, we believe that the findings have ramifications for all Air Force aircrew training. The most significant of these are:

1. Formal schoolhouse instruction will decline in scope and importance to be replaced by unit-level continuation training tailored to the squadron's DOC. This could result in a more "mission-ready" force, but only if appropriate training resources (qualified IPs and supporting technology) are allocated as necessary.

2. At present, Air Force squadrons are limited in satisfying training requirements due to major deficiencies in two areas: specialized training equipment and application of instructional technology principles. This results in some skills and knowledges being marginally trained and uncertain quality control over the product.

3. There are chronic training problem areas (e.g., electronic warfare, switchology, weapons employment, joint operations coordination, etc.) that are as amenable to solution via low-cost, off-the-shelf training devices and software.

4. The flying portion of qualification training is quite good, but a mission rehearsal capability is needed at the unit level.

5. The Air Force does not fully exploit the potential of part-task training methods and devices.

6. The Air Force must establish a better "connection" between unit training requirements and POM/acquisition procedures.

CONCLUSIONS

Aircrew Survey. The findings from the aircrew portion of the survey may be summarized as follows:

1. Multiforce, dissimilar aircraft, air combat training should be increased.

2. 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 utilization, electronic combat, and cockpit switchology.

3. The single most difficult aspect of maintaining mission readiness is retaining proficiency in air combat.

4. The squadrons rated the inflight aspects of both mission qualification training and continuation training as "good", but as noted previously, more dissimilar aircraft air combat training is desired. All flying training would be improved with fewer mission types and better alternate sortie planning.

5. The squadrons rated ground training between "adequate" and "good." The major areas of deficiency are found in training electronic combat, weapons effects, and switchology. The ground training would be greatly enhanced with better media such as full-mission simulators and specialized part-task trainers.

6. When the elements involved in ground training are considered, the simulators and video tape recordings are viewed as very useful training devices. The briefings/instruction by subject matter experts are also greatly appreciated. All other elements are considered more or less of marginal value.

7. One problem, chronic throughout the PACAF F-16 squadrons, is a failure to "train the trainers." Squadrons are either unable or unwilling to teach their instructor personnel the fundamental methods and techniques of instruction.

8. There is no doubt ancillary training could be improved. Better software and more carefully crafted media packages would make a significant increase in their quality. However, considering the minimal importance accorded to this activity, it is our opinion that such an undertaking is not worth the cost and time.

9. As regards professional military training, we believe that quantum advances in distributed training technology are necessary before this type of training becomes practical at remote locations.

10. In the PACAF F-16 squadrons, there are four principal impediments to unit-level training. These are weather, upgrade requirements, air space and ranges, and

micromanagement and tasking by higher headquarters. Weather and airspace/ranges are not factors within Air Force control, but relief from certain, rather arbitrary training gates and burdensome bureaucracy are.

Management Survey. There was not the same degree of consensus in the management findings. The following four items summarize what we found:

1. As discussed in the previous section, almost all squadron-level training problems could be substantially reduced by changing tour length and assignment policies. This has been noted many times and it appears unlikely that any modification to the existing procedures will occur.

2. The impact upon PACAF squadrons of reduced training syllabi in the F-16 formal schoolhouse will probably be quite severe. This observation has been verified by recent information from PACAF which indicates that several more sorties and three to four additional weeks are required by aircrews to reach mission-ready status.

3. Embedded training capabilities in combat aircraft may not be the panacea they are envisioned to be. Opinion as to their value was sharply divided. Some personnel believed this approach could solve nearly all their training problems, others thought it was "too dangerous" to be incorporated in a frontline fighter.

4. There was considerable agreement on the potential of part-task training technology. There was almost universal accord that there were many areas where the part-task training and devices could be used. The development of low-cost training technology for direct transition from the laboratory to the squadron would be feasible. This finding represents the best match between the user's requirements and the technical capability of the laboratory to result from this needs assessment.

To conclude, this survey of PACAF F-16 squadron-level training discovered many opportunities for the application of new instructional methodology and devices. It remains to be seen if the acquisition process can take advantage of modern technology and training practices.

APPENDIX A

SQUADRON LEVEL TRAINING SURVEY
MPC Document Control Number: SCN 9061B

DATE _____ UNIT _____

CURRENT PILOT DATA:
Pilot 1) Rank: _____, Rating: _____, F-16 hours/yrs: _____/_____
Pilot 2) Rank: _____, Rating: _____, F-16 hours/yrs: _____/_____
Pilot 3) Rank: _____, Rating: _____, F-16 hours/yrs: _____/_____
(Ratings: Wing=WG, Flight Lead=FL, Instructor=IP, SEFE, SQ Supervisor=SS)

HISTORY (Prior aircraft):

	Aircraft	No. Hours/Ratings	Command/Organization	MR
Pilot 1)	_____	_____/_____	_____	___
"	_____	_____/_____	_____	___
Pilot 2)	_____	_____/_____	_____	___
"	_____	_____/_____	_____	___
Pilot 3)	_____	_____/_____	_____	___
"	_____	_____/_____	_____	___

MISSION/JOB TRAINING

1. What level are you currently trained to?
Pilot 1) IQT_____ MQT_____ MS_____ MR/A_____ MR/B_____ MR/C_____
Pilot 2) IQT_____ MQT_____ MS_____ MR/A_____ MR/B_____ MR/C_____
Pilot 2) IQT_____ MQT_____ MS_____ MR/A_____ MR/B_____ MR/C_____

2. Other than DOC mission, what special missions do you currently train in?
Pilot 1) CAS___, JAAT___, PGMs___, MAROPS___, SAR___, NUC___, OTHERS_____
Pilot 2) CAS___, JAAT___, PGMs___, MAROPS___, SAR___, NUC___, OTHERS_____
Pilot 3) CAS___, JAAT___, PGMs___, MAROPS___, SAR___, NUC___, OTHERS_____

a.) Does training for special missions have any impact on your primary mission performance (good or bad)?
Pilot 1) ____ / If yes, how? _____
Pilot 2) ____ / If yes, how? _____
Pilot 3) ____ / If yes, how? _____

TRAINING REQUIREMENTS

3. MCM 51-50 defines the levels and prerequisites of MR status:

a.) Beyond the 51-50 Manual is there any other "driver" of your unit training program?
Pilot 1)_____
Pilot 2)_____
Pilot 3)_____

b.) What aspects of your mission need more emphasis or better training? If more than one, rank them
Pilot 1)_____
Pilot 2)_____
Pilot 3)_____

4. Who manages your current training program? (rank/job title: i.e. MAJ/FC)
Pilot 1)_____/_____ Pilot 2)_____/_____ Pilot 3)_____/_____

5. Considering the process of attaining/maintaining MR status from a training and skills development/maintenance standpoint (not wx, etc.):

a.) What is the most difficult aspect of attaining MR?
Pilot 1) _____
Pilot 2) _____
Pilot 3) _____

b.) What is the most difficult aspect of maintaining MR?
Pilot 1) _____
Pilot 2) _____
Pilot 3) _____

c.) Are these difficulties affected by a lack of training aids? (y/n)
Pilot 1)_____Pilot 2)_____Pilot 3)_____

6. Rate the Mission Qualification Training (MQT) program in your unit:

INFLT: marginal = 1, adequate = 2, good = 3, very good = 4
Pilot 1)_____Pilot 2)_____Pilot 3)_____

a.) If you rated marginal or adequate, was it mainly because of:
___/___/___internal deficiencies (poor planning/use of training resources)
___/___/___external deficiencies (no $/gas/wpns/ranges/etc, manpower)
___/___/___other reasons (none of the above) Explain _____
_____

b.) Did any areas of inflight training need more emphasis?
Pilot 1) ____ / If yes, which area?_____
Pilot 2) ____ / If yes, which area?_____
Pilot 3) ____ / If yes, which area?_____

GRND: marginal = 1, adequate = 2, good = 3, very good = 4
Pilot 1)_____Pilot 2)_____Pilot 3)_____

c.) If you rated marginal or adequate, was it mainly because of:
___/___/___internal deficiencies (poor planning/use of training resources)
___/___/___external deficiencies (no $/gas/wpns/ranges/etc, manpower)
___/___/___other reasons (none of the above) Explain _____
_____

d.) Did any areas of ground training need more emphasis? If yes, amplify
Pilot 1) _____ /_____
Pilot 2) _____ /_____
Pilot 3) _____ /_____

e.) Did any areas of ground training need more/better training aids or media? If yes, amplify _____
Pilot 1) _____ /_____
Pilot 2) _____ /_____
Pilot 3) _____ /_____

7. Rate your Flight Lead upgrade training program (if applicable):

INFLT: marginal = 1, adequate = 2, good = 3, very good = 4
Pilot 1)_____Pilot 2)_____Pilot 3)_____

a.) If you rated marginal or adequate, was it mainly because of:
___/___/___internal deficiencies (poor planning/use of training resources)
___/___/___external deficiencies (no $/gas/wpns/ranges/etc, manpower)
___/___/___other reasons (none of the above) Explain _____

b.) Did any areas of inflight training need more emphasis? If yes, amplify
Pilot 1) _____ /_____
Pilot 2) _____ /_____
Pilot 3) _____ /_____

GRND: marginal = 1, adequate = 2, good = 3, very good = 4
Pilot 1)_____Pilot 2)_____Pilot 3)_____

c.) If you rated marginal or adequate, was it mainly because of:
___/___/___internal deficiencies (poor planning/use of training resources)
___/___/___external deficiencies (no $/gas/wpns/ranges/etc, manpower)
___/___/___other reasons (none of the above) State: _____

d.) Did any areas of ground training need more emphasis? If yes, amplify
Pilot 1) _____ /_____
Pilot 2) _____ /_____
Pilot 3) _____ /_____

e.) Did any areas of ground training need more/better training aids or media? If yes, amplify _____
Pilot 1) _____ /_____
Pilot 2) _____ /_____
Pilot 3) _____ /_____

f.) Was there any instruction/training on how to plan a mission from a training perspective vs just filling 51-50 squares?
Pilot 1)_____Pilot 2)_____Pilot 3)_____

8. Rate your Ops IP (not formal school) upgrade training program (if applic):

INFLT: marginal = 1, adequate = 2, good = 3, very good = 4
Pilot 1)_____Pilot 2)_____Pilot 3)_____

a.) If you rated marginal or adequate, was it mainly because of:
___/___/___internal deficiencies (poor planning/use of training resources)
___/___/___external deficiencies (no $/gas/wpns/ranges/etc, manpower)
___/___/___other reasons (none of the above) State: _____

b.) Did any areas of inflight training need more emphasis? If yes, amplify
Pilot 1) _____ /_____
Pilot 2) _____ /_____
Pilot 3) _____ /_____

GRND: marginal = 1, adequate = 2, good = 3, very good = 4
Pilot 1)_____Pilot 2)_____Pilot 3)_____

c.) If you rated marginal or adequate, was it mainly because of:
___/___/___internal deficiencies (poor planning/use of training resources)
___/___/___external deficiencies (no $/gas/wpns/ranges/etc, manpower)
___/___/___other reasons (none of the above) State: _____

d.) Did any areas of ground training need more emphasis? If yes, amplify
Pilot 1) _____ /_____
Pilot 2) _____ /_____
Pilot 3) _____ /_____

e.) Did any areas of ground training need more/better training aids or media? If yes, amplify
Pilot 1) _____ /_____
Pilot 2) _____ /_____
Pilot 3) _____ /_____

f.) Was there any instruction on training methods or planning a mission from a training perspective vs just filling 51-50 squares? (y/n)
Pilot 1)_____Pilot 2)_____Pilot 3)_____

9. Rate the overall mission training (CT) program in your unit:

INFLT: marginal = 1, adequate = 2, good = 3, very good = 4
Pilot 1)_____,_____Pilot 2)_____Pilot 3)_____

a.) If you rated marginal or adequate, was it mainly because of:
___/___/___internal deficiencies (poor planning/use of training resources)
___/___/___external deficiencies (no $/gas/wpns/ranges/etc, manpower)
___/___/___other reasons (none of the above) Explain _____
_____

b.) Assuming training is defined as "objective/goal oriented activity producing an planned increase in skill"; assess your CT program:
Pilot 1)_____(% training*),_____(% filling 51-50 squares only/practice)
Pilot 2)_____(% training*),_____ // Pilot 3)_____(% training*),_____
* proactive/prescriptive system, (programmed and flowed)

c.) Do any areas of CT need more emphasis or training? (y/n)
Pilot 1) ____ / If yes, which area?_____
Pilot 2) ____ / If yes, which area?_____
Pilot 3) ____ / If yes, which area?_____

d.) Do any areas of CT-related ground training need more emphasis? (y/n)
Pilot 1) ____ / If yes, which area?_____
Pilot 2) ____ / If yes, which area?_____
Pilot 3) ____ / If yes, which area?_____

e.) Do any areas of CT-related ground training need more/better training aids or media? (y/n)
Pilot 1) ____ / If yes, which area?_____
Pilot 2) ____ / If yes, which area?_____
Pilot 3) ____ / If yes, which area?_____

10. What are the factors that seem to have the greatest effect on your unit's flying training program? (positive/negative)?
Pilot 1) _____
Pilot 2) _____
Pilot 3) _____

11. Does your unit use methods other than meeting 51-50 requirements/currencies to evaluate the effectiveness of its mission (flying) training program?
Pilot 1) ____ / If yes, describe?_____
Pilot 2) ____ / If yes, describe?_____
Pilot 3) ____ / If yes, describe?_____

*Optional Q (If no, what would they evaluate and how?) _____

12. Does your unit evaluate exercise results? _____
If yes, who does this and what do they do? _____

FTU TRAINING

13. In the time between FTU/IQT and unit MQT/MR did you experience any skill or knowledge loss?
Pilot 1) ____ / If yes, describe? _____
Pilot 2) ____ / If yes, describe? _____
Pilot 3) ____ / If yes, describe? _____

a.) If yes above, would you say that the degree of skill loss or the type of knowledge lost was important enough that methods or devices should be developed to help retain that knowledge/skill(s)?
(y/n) Pilot 1)_____ Pilot 2)_____ Pilot 3)_____
Comments: _____

METHODS/MEDIA

14. What percentage of your unit's ground training is done in a briefing room environment? (i.e. group sessions or structured/lecture situation)
Pilot 1) _____% Pilot 2) _____% Pilot 3) _____%

a.) Rank the method(s) of instruction used in the above environment?
Pilot 1) Discussions/seminars____, briefings____, other____(list_____)
Pilot 2) Discussions/seminars____, briefings____, other____(list_____)
Pilot 3) Discussions/seminars____, briefings____, other____(list_____)

b.) Rank the media used in the above environment?
Pilot 1) Boards/models____, slides____, TV____, handouts____, other_____
Pilot 2) Boards/models____, slides____, TV____, handouts____, other_____
Pilot 3) Boards/models____, slides____, TV____, handouts____, other_____

c.) Which media do you prefer? Pilot 1)_____
Pilot 2)_____ Pilot 3)_____

d.) Do you feel that this type of ground training could/would be enhanced if new methods/media were used?
(y/n) Pilot 1)_____ Pilot 2)_____ Pilot 3)_____

15. Does the squadron use a systematic approach in developing instruction for your ground training? _____
If yes, describe _____

a.) Does the squadron receive any help/guidance from the wing or other headquarters in the above effort? _____
If yes, describe _____

16. Rate the adequacy of the ground training for the following systems:
(Use scale: Ø=n/avail., 1=marginal, 2=adequate, 3=good, 4=very good)
Pilot 1) FCR(mfd)___, FCC___, HUD___, RHAW/ECM___, WPNS___, OTHER?___
Pilot 2) FCR(mfd)___, FCC___, HUD___, RHAW/ECM___, WPNS___, OTHER?___
Pilot 3) FCR(mfd)___, FCC___, HUD___, RHAW/ECM___, WPNS___, OTHER?___
--Comment on any rated 1 or 4 above? _____

17. What percentage of ground training is done by the trainee on his own?
(self-paced texts, CBT, TV, etc.) Pilot 1)___% Pilot 2)___% Pilot 3)___%

a.) Are instructional aids which can be used outside the squadron (other than training manuals) available? ____ What are they? _____

18. Estimate the amount of time you spend per week in informal/peer-based training situations such as "war stories" and informal group sessions discussing mission related topics (i.e. weapons employment):
Pilot 1)_____hr(s) / Pilot 2)_____hr(s) / Pilot 3)_____hr(s)

19. Estimate how much of your ground training is conducted using the methodologies below:
Pilot 1) _____(% knowledge tests only), _____(% class/lesson)
Pilot 2) _____(% knowledge tests only), _____(% class/lesson)
Pilot 3) _____(% knowledge tests only), _____(% class/lesson)

2Ø. How effective are the following ground training resources in your unit?
(Use scale: Ø=n/avail., 1=marginal, 2=adequate, 3=good, 4=very good)

SIM/OFT_____/_____/_____, CFTs_____/_____/_____, PTTs_____/_____/_____,
Aircraft_____/_____/_____, CAI_____/_____/_____, VTRs_____/_____/_____,
audio/visual aids_____/_____/_____, visual aids slides_____/_____/_____,
audio aids (tapes)_____/_____/_____, 1-on-1's (SMEs)_____/_____/_____,
lectures/briefings_____/_____/_____, regs and manuals_____/_____/_____,
programmed texts_____/_____/_____, mock-ups/equipment_____/_____/_____,
--Comments on any rated 1 or 4 above? _____

a.) Which of the above do you use the most in mission related ground training? Why?
Pilot 1)_____
Pilot 2)_____
Pilot 3)_____

b.) Which would you like to see used more? _____
Pilot 1)_____Pilot 2)_____Pilot 3)_____

c.) Is there any particular area or type of ground/ancillary training that suffers significantly from lack of effective training aids/media? (y/n)
Pilot 1) ____ / If yes, which area?_____
Pilot 2) ____ / If yes, which area?_____
Pilot 3) ____ / If yes, which area?_____

21. Regarding ground training, would you say any problems are a function of:
1 = tng mgt (info needs to be taught better way)
2 = content mgt (too much time wasted learning unimportant info/skills)
Pilot 1)_____Pilot 2)_____Pilot 3)_____

PLANNING/PROGRAMMING & MANAGEMENT/EVALUATION

22. What are the problems/hindrances to effective training management in your squadron (if any)?
Pilot 1) _____
Pilot 2) _____
Pilot 3) _____

23. Besides logging 51-50 requirements and currency "squares", is training data collected and analyzed? _____
If yes, describe _____

a.) Do you use AFORMS info for other than tracking 51-50 progress? _____
If yes, describe _____

b.) Is your unit flying and ground training tracked by computer? _____
If not, do you know why? _____

c.) Beyond Stan/Eval and IG evals of your training records, is there any evaluation done of the unit's training processes and effectiveness? _____

24. Is any training planning (beyond scheduling and tracking of 51-50) done at your unit? _____
If yes, describe _____

a.) Is training planning monitored/evaluated for effectiveness? _____

b.) If yes above, have there been any training changes made as a result of this planning/evalution? _____
Have these changes been successful? _____

25. How would you improve your ground training program?
Pilot 1) _____
Pilot 2) _____
Pilot 3) _____

26. How would you improve your flying training program?
Pilot 1) _____
Pilot 2) _____
Pilot 3) _____

ANCILLARY TRAINING & PME
(Ancillary Training is ground training that is not mission related.)

27. Estimate the following ancillary training methodologies:
Pilot 1)
knowledge testing ____%, read file/sign-off ____%, class/briefing ____%
Pilot 2)
knowledge testing ____%, read file/sign-off ____%, class/briefing ____%
Pilot 3)
knowledge testing ____%, read file/sign-off ____%, class/briefing ____%

a.) How would you rate the training effectiveness of the above ratio?
Answer: marginal = 1, adequate = 2, good = 3, very good = 4
Pilot 1)_____ Pilot 2)_____ Pilot 3)_____

b.) If 1 above, what/how would you change?
Pilot 1) _____
Pilot 2) _____
Pilot 3) _____

c.) Do you feel that ancillary training could/would be enhanced if new methods and media were used? (y/n)
Pilot 1) ____ / If yes, how?_____
Pilot 2) ____ / If yes, how?_____
Pilot 3) ____ / If yes, how?_____

28. Compared to mission-related ground training do you consider AT?
Answer: 1 = equal to other GT, 2 = less important but worthwhile,
3 = much less important than other GT/could spend time in better ways
Pilot 1)_____ Pilot 2)_____ Pilot 3)_____

29. What, if any, formal PME have you done?
Pilot 1)_____ Pilot 2)_____ Pilot 3)_____

a.) If none, why not?
Pilot 1) _____
Pilot 2) _____
Pilot 3) _____

b.) If yes, was it?
Pilot 1) _____ correspondence _____ seminar
Pilot 1) _____ correspondence _____ seminar
Pilot 1) _____ correspondence _____ seminar

c.) If yes above, what changes in media/methods would you propose to improve unit level PME?
Pilot 1) _____
Pilot 2) _____
Pilot 3) _____

FINAL QUESTION:

30. On the basis of what we have told you about HSD/ , where and how do you think the Laboratory can be of most help to you?
Pilot 1) _____
Pilot 2) _____
Pilot 3) _____

APPENDIX B

MANAGEMENT SURVEY

INTRODUCTION

An introductory discussion concerning definition of such terms as training, practice, exercises, POM, aircrew training research, and other terminology may be beneficial in aiding communication between AL/HRA and the operational squadron personnel being interviewed.

AFSC (Armstrong Laboratory), at the invitation of PACAF Headquarters, is gathering data on aircrew training practices within PACAF. Your unit was selected to participate. Data will be used to help determine the direction of research in scientific and technical means to improve training efficiency across the Air Force. We value your opinions and comments. All information is nonattributable to any individual.

1. Other than FTU, what relation does your unit maintain with TAC for pilot training? With ATC? HQ PACAF?, other USAF and foreign commands?

2. Should additional relationships be established with other agencies such as TAC, ATC, Air Staff and HQ PACAF to assist your unit in enhancing training?

3. Are you able to obtain the resources you need to support your training requirements? If not, why and what is the result?

4. What training/exercises do you perform with other services/countries? Are they effective? Why or why not?

5. Are there any current initiatives for training development and/or evaluation in your unit? Do they work?

6. How do you provide POM inputs to HQ PACAF? How often do your POM requests make it into the Congressional budget?

7. What do you need to improve the training process in your unit?

8. How is the training process evaluated in your unit? By whom? What criteria do they use?

9. Is there clear training policy and guidance from Wing HQ? HQ PACAF?

10. In view of current and probable future cuts in resources, what aspects of existing training programs will require restructuring and/or redevelopment?

11. What new training needs (or shortfalls in skills and knowledge) will result from the reduction of flying hours in the FTU syllabus and the planned loss of LIFT.

12. How generalizable will the results of the present survey be to the USAF F-16 community and to the rest of PACAF? To the TAF?

13. If AL/HRA brought you an effective training product or innovation, what would you do with it?

a. What conditions concerning its use would apply?

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

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

d. Would the innovation be more likely to be used if your unit developed it cooperatively with HRA?

14. How would you assess the value of the embedded training concept for use in operational environments?

15. Are your training officers and IPs conversant with current training technology concepts and instructional methods?

a. Do you think it is important that they have an understanding of those methods and concepts?

b. If AL/HRA developed a convenient, user-friendly approach to keep your training officers and IPs current in such methods and concepts, would they use the AL/HRA product? Would you insist they use it?

16. Would you have an interest in establishing a working relationship with AFSC (HSD) for continuing training R&D and technology transition?