

# 1980

RESEARCH AND DEVELOPMENT  
4750TH AIR DEFENSE WING, (WEAPONS)  
YUMA COUNTY AIRPORT  
Yuma, Arizona

A Firing Error Indicator Conference was held at 1300 hours, 22 May 1956. The following named personnel attended:

<u>NAME</u>	<u>RANK</u>	<u>HEADQUARTERS</u>
M. H. Ashkins	Col	Commander, 4750th Air Def Wing - Yuma
G. T. Eagleston	Col	4750th Air Def Wing - Yuma
R. C. Anderson	Lt Col	Hq, ARDC
W. D. Jones	Lt Col	WADC
Vermont Garrison	Lt Col	4750th Air Def Wing - Yuma
W. O. Jensen	Major	4750th Air Def Wing - Yuma
W. M. Moran	Major	AFAC
W. E. Best	Capt	4750th Air Def Wing - Yuma
S. W. Gillingham	Civ	WADC
L. W. Huster	Civ	WADC
J. A. Marshall	Civ	4750th Air Def Wing - Yuma
L. D. McClellan	Civ	Hughes Aircraft Company
Bruce McVey	Civ	Hughes Aircraft Company
J. J. O'Reilly	Civ	Hughes Aircraft Company
T. F. Peirce	Civ	Hughes Aircraft Company
B. Roberts	Civ	AFAC
R. L. Roderick	Civ	Hughes Aircraft Company
W. F. Thornton	Civ	Del Mar
R. M. Tryon	Civ	Hughes Aircraft Company

MAJOR JENSEN: I would like to extend a welcome to all of you present today. By way of an agenda, Colonel Ashkins will make a few remarks pertaining to the problem here at Yuma and ADC's feelings on the matter. Following this, Mr. McVey will present a briefing by personnel from Hughes Aircraft.

COLONEL ASHKINS: We received a message from ADC stating that the procurement of a large number of Thornton Scorers would be held in abeyance for a period of 90 days while we here at Yuma ran a crash program trying to prove the feasibility and workability of the New Castle (ELCO) scoring system. The message stated further that certain people would be represented here - some of them for the sole purpose of determining that we are on the right road and assuring complete coordination between all agencies.

We're going to try to prove the New Castle Scorer in the next 45 days. Right now, we have many problems to surmount. The people here at Yuma feel that we could solve these problems if we could get access to some of the experts at Hughes. We understand that WADC has an open-end contract with Hughes. If possible, we would like to use this to get Hughes' help. That is why Colonel Anderson is here and the people from WADC.



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This message opened in that we are not limited to this particular item alone. ADC is open to any device that will solve our firing error indicator problem. We thought we would have a North American Autonetics device but that turned out to be on paper only. Many things hinge on this FEI system. We are now into jet bombers pulling 9x45 targets at ridiculous speeds and altitudes when we should have a high speed frangible system. This can't be done till we get a good FEI system. We will soon get into Falcon firing also. This too is dependent upon an FEI system.

I don't how I can further emphasize that the key to many of our problems lies right here with the FEI. All I can say is we must solve this problem as soon as possible.

MR. MC VEY: I want to make sure that I understand what this meeting is to accomplish. My understanding is that we should decide whether or not there is an FEI system better than the Thornton Scorer which ADC is saying they are going to buy unless we come up with something better. If there is a device better in overall system than the Thornton Scorer, we should decide what this device is. Which ones of the proposed systems look so promising that they warrant sufficient testing and development? Each one of these devices is in some stage of development. None are fully developed and tested.

It seems important to me that we talk about what we would like to have in an FEI system. I have made a list of these things in what seems to me to be the proper order:

- (1) Accuracy.
- (2) Rapid availability of film
- (3) Reliability.
- (4) Rapid and easy assessment procedure.
- (5) Minimum amount of film processing.
- (6) Minimum amount of support and maintenance for particular equipment.
- (7) System assessible against a very small target.
- (8) Minimum installation insofar as changes to aircraft and fire control system are concerned.
- (9) No drop tanks required.
- (10) That it be usable with the missile firing system.

- (1) they are immediately applicable to FEI.
- (2) They use at least one forward pointing camera.



Minutes of FEI Conference, 22 May 1956 (Cont'd):

- (11) Inexpensive.
- (12) Not dependent upon a canned attack.
- (13) Adaptable to scoring either rocket by rocket or just rocket salvo.
- (14) Dry rocket capability.

The FEI problem really is what the distance of closest approach of each rocket was to the target or what the distance of closest approach was of the center of the rocket salvo to the target. We want to measure this distance by means of the FEI. All the systems I know about that have been proposed involve the use of a camera mounted in the interceptor. If you have a camera mounted, the real trick is knowing when to run the camera. There are three general methods for judging when to take a look at where the rockets went.

- (1) Stereo - you determine the range to the target by stereo means.
- (2) Using radar to determine range to target and rockets.
- (3) Combination of the two. Uses radar to tell about when is the right time to take the picture and uses camera to tell what the position of the rockets was to the target.

These are the schemes which use radar:

- (1) North American.
- (2) Thornton Scorer.
- (3) ELCO.
- (4) Combination scheme of launch voltage and travel voltage.
- (5) Timer.
- (6) Combination of these radar schemes plus stereo. This takes one stereo picture from two cameras.

These are the schemes used to tell when to take a look at the rockets.

MR. RODERICK: There are actually six systems which look sensible, reasonable, and logical to me. All six have certain things in common. Two of these are:

- (1) They are immediately applicable to FEI.
- (2) They use at least one forward pointing camera.



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Following is a brief run-down on each of these systems with their advantages and disadvantages.

**Stereopair - Unsynchronized Movie Stereo:** This system is simple and easy to use; however, it is not accurate enough. Advantages: It has been proven and equipment for it has already been purchased. Disadvantages: It is too inaccurate. The assessment time is relatively too long. It is no good for 24 rockets.

**Synchronized Movie Stereo:** This is the same thing as the above except the two cameras are synchronized. It is advantageous in that it is accurate and its components are shelf items. Disadvantages: There are two films to process. There are two separate cameras to operate. It has the same assessment time as the stereopair. It is no good for 24 rockets.

**Synchronized Still Stereo:** Advantages: It is accurate. You get excellent target and rocket definition. It has the least film processing. Disadvantages: Very large cameras involved. Major modification of drop tanks required. It is no good for 24 rockets as some may be obscured.

These are three types of systems that are of the stereo type and look feasible.

**Thornton Scorer:** Advantages: Its main advantage, other than the fact that it works, is that it has been tested and is pilot produced at Ogden. Disadvantages: It is expensive. It involves a maintenance problem. There is loss of fuel in one drop tank. It requires the use of chase aircraft.

**Thornton Scorer Using FCS Radar:** This system uses the same basic idea as the Thornton Scorer except it uses the fire control system to get the video. Advantages: It is minus APG 30 radar. It might be used as a remote scope recorder or an airborne recorder. Disadvantages: More complex than cameras. Some additional test required. Not a shelf item. Will create an installation problem. Modification of radar set required to make it work.

**New Castle Firing Error Indicator:** Advantages: Involves a simple assessment procedure. Uses only one film. Disadvantages: Research and development required. Some modification to fire control system required. It is not fail safe. It is probably pretty critical to adjust.

MR. MC VEY: Would you review which ones would work against a frangible target?

MR. RODERICK: All of the radar schemes will work if you can see the target. You have to go to large cameras or still cameras to get return without actually seeing the target.



Minutes of FEI Conference, 22 May 1956 (Cont'd):

MAJOR JENSEN: I would like to thank the Hughes people for that concise briefing. We are still faced with the problem. We have a 60 day time limit which we are well into already. We have a deadline of 13 July to let ADC Headquarters know whether some one of these systems satisfies us here at Yuma and also to prove it so that we can say let's do away with the Thornton Scorer. Naturally, we would like to have something in hand that would work when we go to ADC.

COLONEL ASHKINS: In this respect, it seems that they are giving us up until 13 July to assess this thing for feasibility, applicability, and reliability for the sole purpose of immediately going into production. Development and testing must be completed by 13 July. Major Moran from AFMC, on this date, has to have the figures saying that this will work and it is all right to start production. If we have made no further progress by 13 July, we will have to say we failed and go into procurement of Thornton tanks. However, if we have made some progress, we can recommend what can be done in a certain time limit to ADC. They are going to purchase Thornton Scorers if we can't prove something by this date. Since we have this deadline, we are going to have to decide which one of these systems is at the most advanced stage of development and bring it up to a workable system. We will have to work with the hardware we have right now and all we have is the New Castle Scorer. We, therefore, are asking Hughes to help us make it work by 13 July.

MR. MC VEY: I believe there are some other schemes which would be available for assessment within 45 days.

COLONEL ASHKINS: We have had two weeks to get any hardware here and we have nothing but the ELCO Scorer. The basic question is whether or not Hughes will assist us in getting the New Castle Scorer to work.

MR. MC VEY: Hughes will give you consulting advice but they will not take the responsibility of the development of this system. This would include occasional visits by Hughes people down here at Yuma and visits by your people to the plant.

CAPTAIN BEST: The first thing we are going to have to decide is whether or not we are going to get an FEI. I don't care what FEI you put up, it has more disadvantages than advantages. The only way we are going to get a better one is put it in the field and really test it. We want to be able to sit down with you Hughes people at the completion of the project and say this system is approved by Hughes.

MR. MC VEY: The final decision doesn't rest with Hughes as to what device you develop.

COLONEL ASHKINS: The main thing is getting the hardware here and getting a decision by 13 July. We are not telling you what to help us with yet. We want Hughes to assist us with any problems we want to present to them in the next 45 days.



Minutes of FEI Conference, 22 May 1956 (Cont'd):

MR. MC VEY: I had hoped we would be able to give you a definite answer today but only John Rubel or General Shoope can answer this question and I was unable to get hold of one of them personally. What is really required is that we place people from Hughes to work almost on contract for you on this problem.

CAPTAIN BEST: Actually, what we need is just a few of your people to work on this, perhaps three or four. Our main concern right now is length of the main bang. We would like to talk to your transmitter and receiver design man on this. This main bang is something we can't seem to do anything about. The IF Gain has something to do with it. As long as the IF gain is involved, we feel it can be shortened. We would like your field modification people's advice. Hughes is going to have to tell us what we need so that when the FEI is completed Hughes Aircraft will agree it will not compromise the fire control system. The only two people I know we need right now are your transmitter and receiver design man and a man to help us redesign. We need your field modification man very much because this will take a modification of the fire control system.

COLONEL ASHKINS: What we are asking for is the top people in these fields only.

MR. MC VEY: I don't have the authority to commit Hughes to try to do what Colonel Ashkins is asking. What you will have to have is full time people on this and also any additional people we could make available to you. These people would have to work back and forth between Hughes and Yuma as the laboratory facilities are there and the flight facilities here.

COLONEL ANDERSON: Actually what we want to do then is let Hughes have this box and work on it and we assist them the best we can.

COLONEL JONES: This term "open-end contract" has been talked about. I don't think we can say we have the degree of flexibility which the term implies. Hughes has set up a program under Project 456 and I am sure this is uppermost in their minds.

CAPTAIN BEST: We in no way want to take any effort away from the 456 program which is presently underway. But we would very much like Dr. Roderick to take charge of our problem and keep tabs on it.

MR. MC VEY: I believe this is up to AMC. If they want to tell Hughes to divert effort from the 456 program to the FEI, we will certainly do it. They will have to decide.

CAPTAIN BEST: Are you willing to say that three Hughes men would cause another project to slip?

MR. MC VEY: No, but I'm saying your estimate of three or four men is incorrect. You would have to have more assistance than that. We ought to make an estimate of just how much manpower you will need to get the job done.



Minutes of FEI Conference, 22 May 1956 (Cont'd):

COLONEL ASHKINS: What we've got to do then is call either General Shoope or Mr. Rubel and see whether one of them will commit Hughes to assist us. All we want is some device that will work by 13 July. We want Hughes to take the system and make it work with our assistance.

The meeting was temporarily adjourned at 1500 hours so that Colonel Ashkins could place a call to General Shoope or Mr. Rubel.

Meeting reconvened at 1545 hours with the following comments:

General Shoope was not available and Mr. Rubel was contacted. Hughes is anxious to do the job; however, they requested a two day period in which to look at the effort involved. There will be a decision made as to the division of effort on this project and the related work that Hughes is doing.

Colonel Ashkins stated that, in his personal opinion, the effort required on the FEI was much smaller than most people considered it to be, and that it did not appear that a full time effort of key people would be required.

Final arrangements were that Hughes would call Colonel Jones at WADC on Thursday, 24 May 56 or Friday, 25 May 56, with their decision. Hughes in turn will notify Colonel Ashkins.

Meeting adjourned at 1600 hours.