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OPTIMUM CULTURE IN THE COCKPIT

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Good afternoon ladies and gentlemen. I am very pleased to be able to participate in this cockpit resource management workshop.

As you know, about two years ago the International Civil Aviation Organization (ICAO) issued an "Accident Prevention Manual." In this manual you can find the following summary:

> "If the air transport accident rate remains static, and the volume of air transport continues to grow, the number of accidents each year will increase. In addition, aircraft size and capacity continue to escalate. Thus each accident will involve, directly or indirectly, more and more people and the associated financial (and social) costs will rise proportionally. If the traveling public is to continue to regard air transport as having an acceptable safety record, then the current accident rates must be reduced."

This will not be an easy task. The ICAO Manual also states: "While the goal of accident prevention is the elimination of all accidents, the fallibility of human nature makes this goal unobtainable." However, we must do the best we can. In the future, if we are to succeed in significantly reducing the accident rate, it will be necessary to go well beyond simply trying to minimize human error. We must also focus our attention on all aspects of human nature. (Slide 1)

I would now like to take some time to look back on the safety of aviation. As all of you know the trend of international air transport accidents has been shown by ICAO. (Slide 2)

This chart shows the trend between 1950 and 1980. The figures indicate the number of passenger fatalities in aircraft accidents for every one hundred million passengers who fly one kilometer. The fatality rate for 1950 was 1.97 persons. It then declined markedly to 0.78 in 1960 and to 0.18 in 1970.

The fatality rate for 1975 declined further to 0.08, or one twenty-fifth of the 1950 level. While the overall accident rate has decreased significantly, from 1975 the rate has leveled off to indicate that different methods and more effective safety methods are necessary.

There is another chart that clearly shows the facts. This chart shows the relative trends of accidents resulting from machine causes and from man causes. (Slide 3)

We can see that a great change has occurred in the relative percentage between machine-caused and man-caused accidents. Machine-caused accidents have declined, while those caused by man have increased. The decline in machine-caused accidents is a direct reflection of a remarkable improvement in the performance and reliability of aircraft equipment.

Indeed, aircraft performance is now approaching the highest possible level of modern technology. A great improvement can also be seen in hardware, airport facilities, ATC systems, and so on.

Presenting a sharp contrast is the steady rise in the proportion of man-caused accidents. This may show that there has not been much improvement in human ability from olden times. We have spent much time and research to improve our aircraft in order to make them more reliable, but less efforts and attention have been given to the officers in the cockpit.

Perhaps some people would say that this accident trend is quite natural, because it is the cockpit crew which has always been required to perform difficult tasks which cannot be done by a machine. Therefore, since the most difficult tasks must be completed by the crew, the machine-caused accidents are low on the chart and the pilot does not do so well.

At any rate, judging from this chart we can say that it is absolutely necessary for us to make every effort to eliminate accidents caused by human factors if we are to improve flight safety performance still further by substantially reducing the aircraft accident occurrence ratio.

It is generally understood that the effect of measures taken to eliminate accidents appear suddenly or abruptly. Then the curve tends to level off as time passes. (Slide 4)

As far as flight safety measures are concerned, emphasis has so far been placed on two points. The one is on improving the reliability of flight equipment by correcting mechanical defects. The other is on selecting the best-qualified candidates for pilots by improving the aptitude tests for flight crew candidates. However, even if the best are selected, it is virtually impossible to keep a pilot constantly in an optimum state in relation to the aviation system because the systsem changes rapidly as time goes on. (Slide 5)

It is easier to improve technology than to review and improve human factors. The result is that the solution to the problem of human factors-related accidents are always left to the last. As a matter of fact, we must admit that the problems of human factors have so far been more or less neglected, compared with problems relating to aircraft technology. Japan Air Lines is no exception. (Slide 6)

In 1977, Japan Air Lines had a DC-8 accident at Kuala Lumpur in Malaysia. The aircraft involved in this accident had flown from Hong Kong to Kuala Lumpur. The accident occurred because the captain of the aircraft descended below MDA without having the runway in sight. He continued the descent until the aircraft struck a hill 260 feet above mean sea level. It was four nautical miles short of the runway threshold. (Slide 7)

A subsidiary contributory factor was insufficient instrument monitoring of the aircraft's flight path by the captain during adverse weather conditions, with several other aircraft holding awaiting their turn for approach. But a more important factor can be said to be the first officer's failure to challenge the captain's breach of published company regulations.

After this accident, the company set up a committee for the purpose of studying overall safety. This Committee was called the "Critical 11 Minutes Committee"--the eleven minutes consisting of three minutes after takeoff and eight minutes before landing. In its studies, the committee discovered that human factors were indeed a major problem and a cause of accidents. It also found that these problems do not come from or begin with technical or pilot skill, but stem from:

- o Misjudgement
- o Lack of knowledge
- o Poor crew coordination
- o Deviation from standard operating procedures
- o Influence from outside factors (Slide 8)

Although this committee pointed out the need for understanding the human factors involved in the cockpit environment, nothing was done at that time because there was no concrete way existing to solve the human factor problem.

In 1983, we established a Human Factor analysis group because of a rise in human error-related accidents and incidents. This analysis group developed a checklist to be used for all company incidents after the Kuala Lumpur accident. (Slide 9)

We now have 50 cases on file including such items as:

- o Taking-off without clearance
- o Outboard engine hit runway when landing
- o Because of the wet runway condition, an aircraft slipped and a taxiway light was broken by the nose gear. (Slide 10)

We found that since 1977, when the Critical 11 Minutes Committee was created, there have been few or no changes made to eliminate the human factor error. We also found that most of our incidents were caused by:

- o Poor crew coordination
- o Inadequate briefing
- o Failure to use accepted procedures

- o Inadequate coordination or timing

- o Delay in taking necessary action (Slide 11)

Up to that time, we had two hull-loss accidents. One was the Tokyo Bay accident caused by the captain's mental incapacitation. (Slide 12) The other was a plane that overran the runway at Shanghai airport due to a rupture of the airbrake bottle which caused some system damage. (Slide 13)

A Fault Tree Analysis (FTA) was used for a detailed analysis of those accidents. The Fault Tree Analysis is basically a logic diagram that attempts to show the complex processes and relationships involved in an accident. It is adapted to show the cause-effect relationships that induce accidents. The FTA thus assists in identifying and tracing the chain-of-events that lead to a system failure. (Slide 14)

This figure is an example of the FTA charts of our Tokyo Bay accident. It includes the symbols commonly used in constructing such a flow diagram starting with the accident at the top of the page and working downwards. The FTA can be considered to progress backwards through different levels via "And" and "Or" gates in response to the question "Why"? The branches become more detailed as all available information is added and leads to basic causes or hazards. In our studies, it almost always arrives at a common cause--that of "human error."

Of course during this period we were also studying for an effective human factors training program, but because of a lack of aviation psychologists in Japan, we looked elsewhere for a suitable human factors program. Our search took us everywhere in the world.

I spoke with many human factors specialists, including government officials and university, military, and nuclear power human factors specialists. However, we were not completely pleased with what we saw. We might have given up our search long ago but we had the great advantage of knowing exactly what we needed.

At that time, in 1983, I received a letter from Capt. Carroll explaining the CRM program developed by United Airlines. The letter stated that Japan Air Lines was facing the same problem that UAL had in 1979. Capt. Carroll suggested that a cockpit management training program would be helpful in addressing the problem of safety in the cockpit.

At the beginning of my own CRM study, I had a basic question about this program which had been developed by American researchers. Because of cultural differences, I questioned whether this type of western-style training program could be adapted to the Japanese way of thinking, especially since the program deals with "human behavior" problems.

Because America is a leading country in the field of behavioral science and there are so many aviation psychologists and researchers, this dilemma could not be ignored. I began observing the differences between American and Japanese pilots.

From my experience of working with American pilots in the UAL public seminars, I feel that American pilots are more task-oriented than are Japanese pilots. Their behavior contrasted with the behavior of Japanese pilots at our seminar in Japan where the Japanese tended to behave in a more group-oriented fashion. (Slide 15)

Therefore, from my study I see America as a task-oriented society. The people seem more aware of themselves as individuals rather than as part of the group. The American culture seems to encourage the individual independent self, while the Japanese culture encourages the development of the dependent group-oriented person.

Japanese modesty is not seen as a virtue in the American culture. In the team discussions during the CRM seminars, I felt that the Americans did not easily accept another person's opinion, whereas Japanese tend to accept another person's opinion whether right or wrong in order to preserve harmony within the group.

Americans will sometimes aggressively support their own opinion, even if they are not entirely correct, because they are competitive and see the situation in terms of winning or losing. In contrast, the Japanese will usually become silent and non-supportive of their own ideas if they see some opposition to them.

Another important point is that Japanese are often conformists who need to identify with a group. Japanese rarely will try to stand out and be creative in a group situation. This is because we want to achieve a sense of harmony. It is a part of our history and our culture. About 1400 years ago a famous Japanese prince called Shotoku Taishi said "the harmony is to be respected." His words and this thought are still alive in the Japanese mind.

Of course, the Japanese are also a competitive people. However, they differ from Americans in that their competition is directed towards an outside group or organization. While the Japanese are very competitive towards each other in their own minds, they will never express that competition verbally.

In our Japanese society, acceptance is highly valued and is achieved through a person's efforts for his group. His efforts, whether useful or not, are seen as his merits and will earn him respect and promotion even if he has little real ability.

Although I saw those differences in our cultures, I realized that in the cockpit situation neither the Japanese way of behavior nor the American way are the best.

I don't think that any culture--whether it is Japanese, American, or any other--fits in with the cockpit environment. And in this sense, cockpit resource management is culture-free. (Slide 16)

There are many situations where authority is shown in the cockpit. There are also times that cockpit authority must be questioned or challenged. And it is in this type of challenge situation that crewmembers react differently based on their cultural background.

Authority is rarely challenged in a group-oriented society. But as we in the airline industry know, this kind of attitude has led to many fatal accidents. On the other hand, in a task-oriented society those in authority may fail to listen to the opinion of others when their authority is challenged. This too has led to fatal accidents. Let me explain this through the use of a "grid." (Slide 17)

As I said before, my feeling is that American pilots are task-oriented and Japanese pilots are mostly group-oriented. Both, of course, have the same goal in mind--that is, the goal of ultimate safety. (Slides 18 & 19)

Even with the same program and objectives, if the culture is different, there will be different approaches to the goal. However, the cockpit environment is culture-free so it is not as important to think of a person's cultural background as it is to think of the approach to the goal of ultimate safety. Crew members can look at their individual safety goals and compare them to their own performance to see if their behavior matches their own safety goals.

After three years of extensive planning and working closely with UAL, we finally began our in-house CRM-LOFT training program for all crew members. We hope to have trained all our crew members within two years. We hope, that after applying CRM to our flight training program that our crew members will realize that the very Japanese attitude towards authority does not belong in the cockpit environment. (Slide 20)

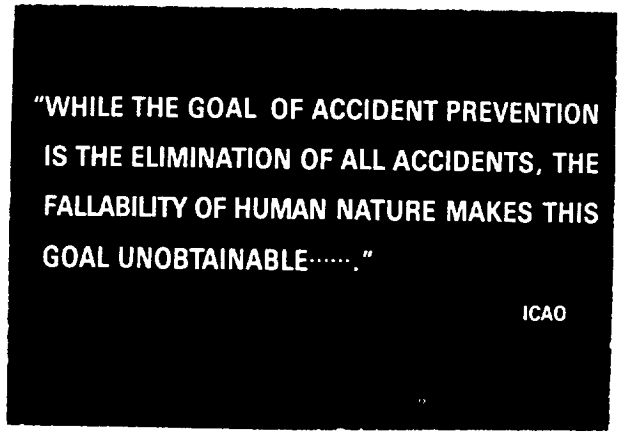
The cockpit environment must be culture-free in order to obtain our ultimate safety goal. I think we must first realize how our culture affects our behavior before we can begin to change our attitude and actions in the cockpit.

And finally ladies and gentlemen, I would like to read this statement from ICAO's Accident Prevention Manual. (Slide 21)

> "If in the future we are to succeed in significantly reducing accident rates, we must significantly increase the efforts to determine and understand the reasons why people behave, act, or respond in the way they do. Only then can we hope to effect some fundamental improvements in the safety record."

Thank you very much.

SLIDE 1



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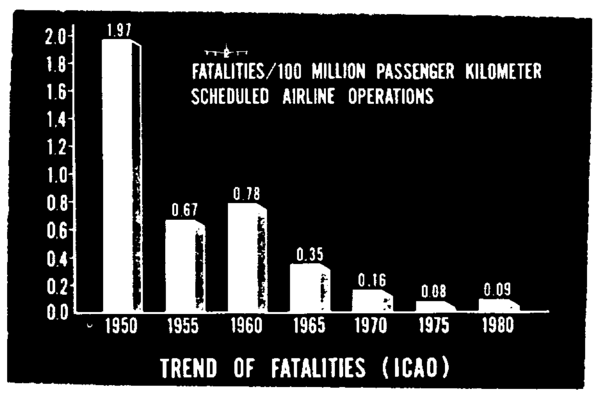

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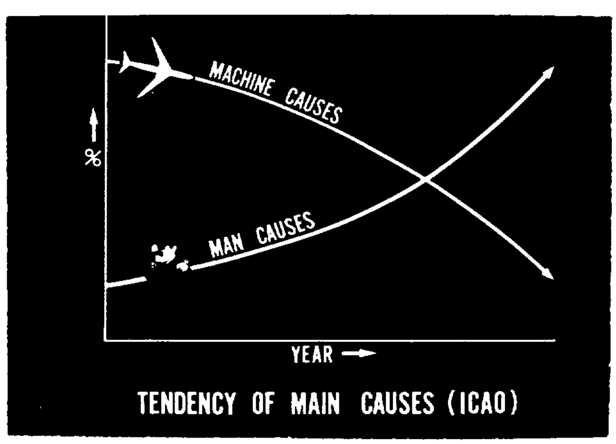

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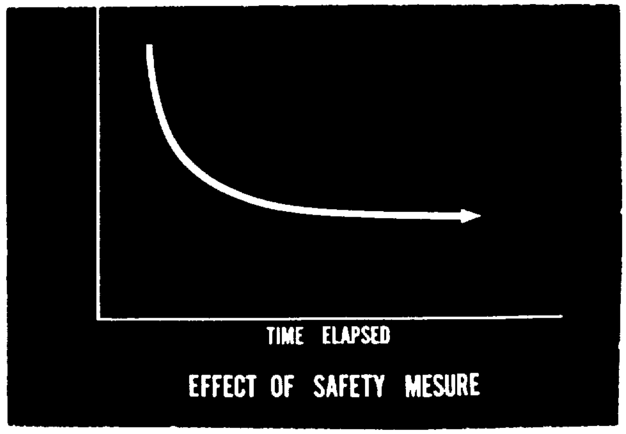

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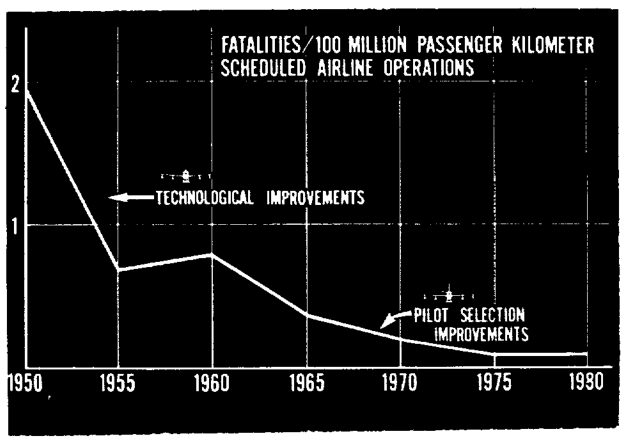

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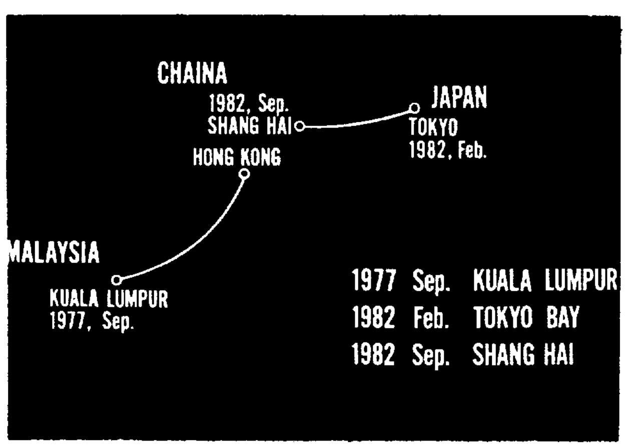


SLIDE 7

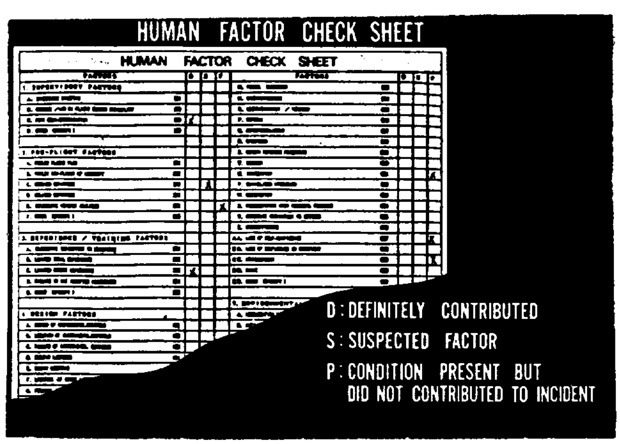
SLIDE 8

CRITICAL 11 MINUTES COMMITTE (1977)

CAUSES OF INCIDENTS AND ACCIDENTS :

— MISS JUDGEMENT
— LACK OF KNOWLEDGE
— POOR CREW COORDINATION
— DEVIATION FROM S.O.P
— OUTSIDE INFLUENCES

SLIDE 9



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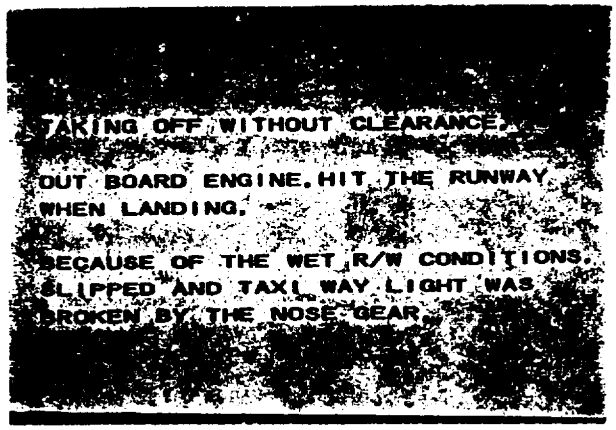

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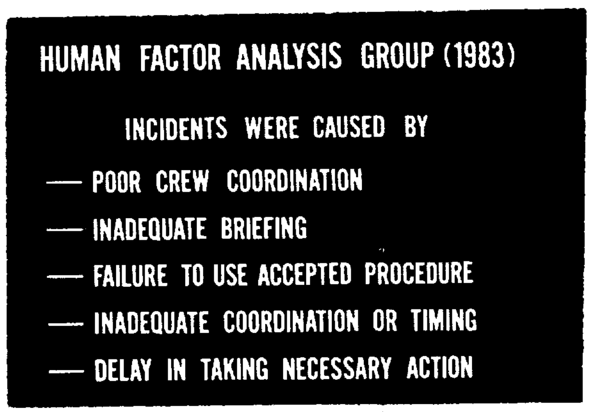

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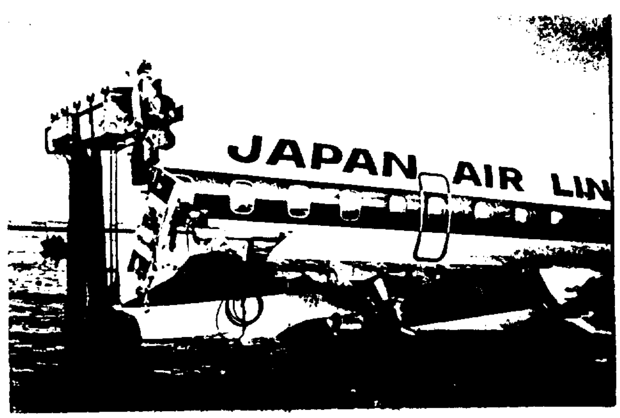

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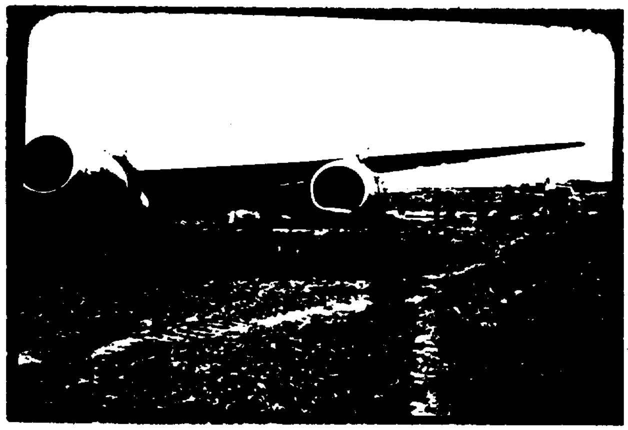

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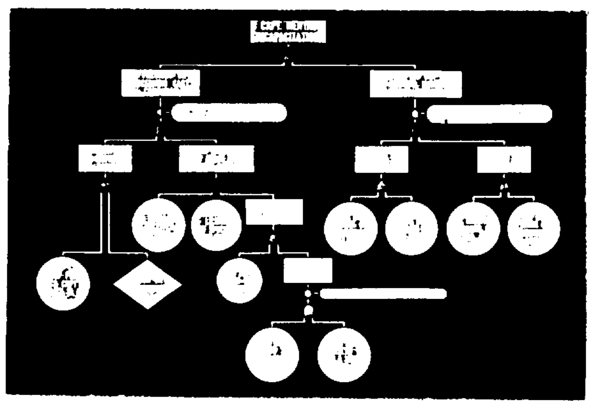

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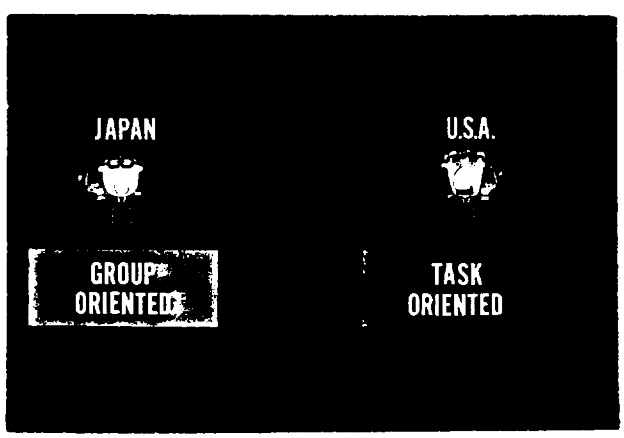

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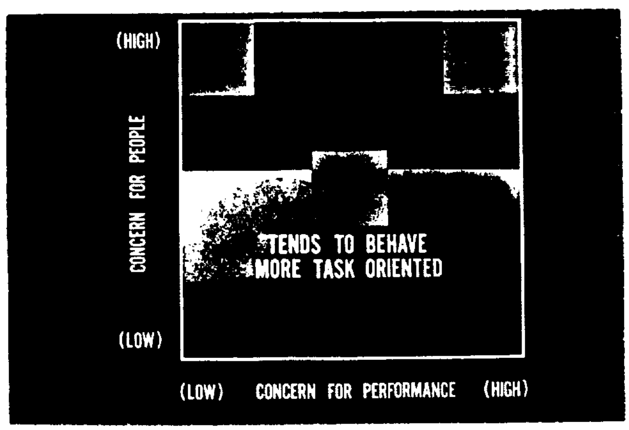
SLIDE 17



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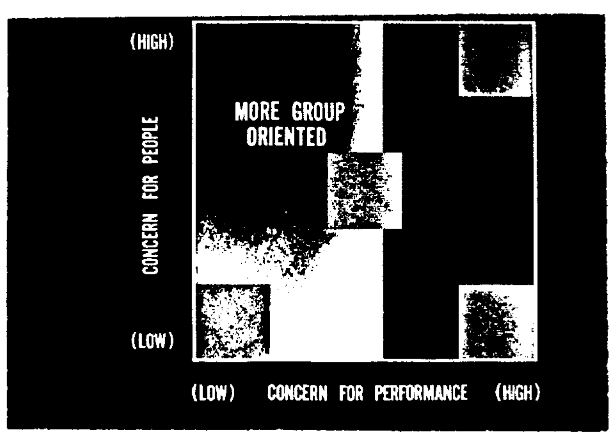

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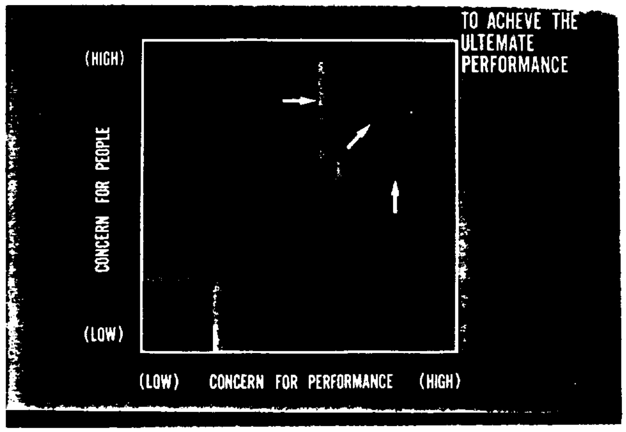
SLIDE 19



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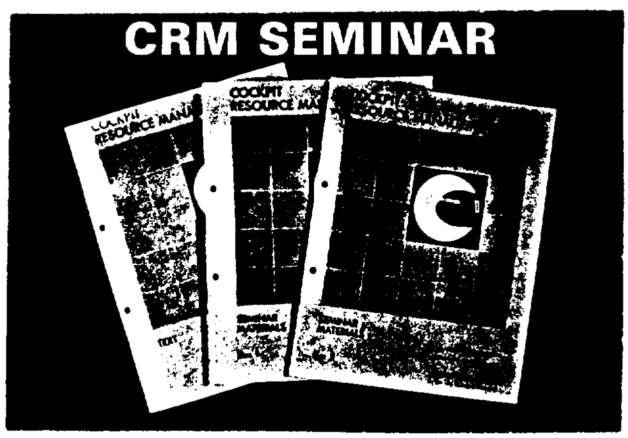

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