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Bio What?

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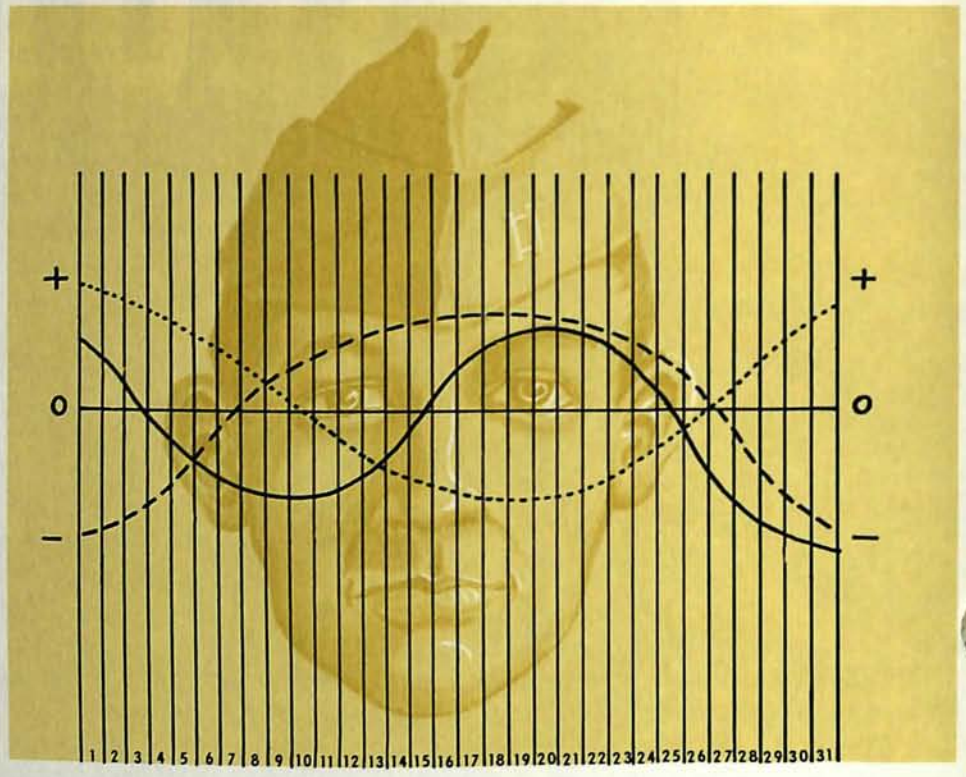

Before we get too deeply into this article, let's lay it on the line for what it is . . . namely an experiment into the human factors side of accident investigation and causation.

When we plaster an airplane alongside a hill, we painstakingly put it back together piece by piece to determine what happened. If the accident was caused by a materiel failure of some sort, we usually find the culprit, the offending piece of gadgetry that failed. And we take it further . . . we find out WHY it failed. When the answer to the "why" question makes itself known, a fix is exposed. The fix is then incorporated into the machine and once again everything is right.

But how about those accidents that are caused by people? Do we go through the same painstaking efforts? Unfortunately not! We find out what the pilot or crewman or maintenance technician did that resulted in an accident but we don't find out WHY he did it. Either we don't know enough about the human animal, such as how and why he reacts in a given manner to a given situation, or we don't know how to apply the knowledge that we possess.

Those who have been involved with accident investigation for any length of time tend to wander around in bewilderment when the same personnel errors are repeated time and time again. We stomp the bushes looking for preventive measures but most of the time we come up with the same old recommendations that surfaced forty years ago.

Familiar sounding phrases such as, "I just don't understand it; Joe is the best pilot in the outfit. How could he make such a mistake?", are common among those who fly . . . and among those who witness their own mistakes and the mistakes of others. Certainly there must be some answers somewhere. We people are unpredictable, but we're not that unpredictable.

A few months ago the Flight Safety Foundation put out a blurb in their September/October newsletter concerning this human factor side of accident investigation and causation. In it they referred to something called the Biorhythm Theory of Accident Causation. And they gave an eye-opening example of the use of the Biorhythm Theory. They stated that a

company in Japan which operates a fleet of some 700 busses, taxis, and a primary railroad has been applying the theory to their operation. The results? Quoted in the FSF newsletter, "In first year of application the accident rate decreased by one-third as against a steeply increasing trend in the country as a whole." Maybe there's something to this biorhythm stuff.

WHAT IS IT ?

It has long been recognized that in a man as well as the rest of nature, many of the functions of life are regulated by rhythms. We witness many of these rhythms in nature, such as a plant opening its leaves to the sunlight or a salmon swimming upstream to its spawning ground. In our own bodies, rhythms, referred to as the clocks of the body, regulate things as sleep, heartbeat, and iration. But there appear to be other clocks of the body that control such things as physical abilities, mental acuteness, and emotional levels . . . Biorhythms.

The first important work in biorhythm analysis was done at the turn of the century by a Swiss professor of psychology, Dr. Hermann Swoboda. In seeking to find why man's disposition changed from "good days" to "bad days" he discovered a rhythmic pattern in man's behavior. He concluded that rhythmic fluctuations occurred in 23 and 28 day cycles and were linked directly with moment of each individual's birth.

During the same time period a German physician, Wilhelm Fliess, conducting parallel studies. He irmed the existence of the 23 and 28 day rhythms by observing his patients, and by tracing illness cycles back to the date of birth.

Approximately twenty years later, a doctor of engineering at Innsbruck, Austria, prepared an analysis of high school and college student performance. In it, he reportedly concluded that an individual has an intellectual cycle of 33 days. During approximately half of the cycle, students demonstrated an ability to grasp new ideas quickly and during the other half of the cycle they were relatively slow to learn.

According to the theory, the three biorhythmic cycles begin at the moment of birth and continue with precise regularity throughout the life of the individual.

The physical biorhythm (shown on Figure 1 as a solid line) goes through a complete cycle in 23 days. The half of the cycle which is shown above the reference line represents the plus half. During this period of time, the body is going through its discharge period and the individual feels better, has more energy, and has more confidence in his physical abilities. Just the opposite is true during the regenerative (minus) phase, shown below the line.

The sensitivity biorhythm (shown on Figure 1 as a broken line) transverses a complete cycle in 28 days. On the high side the individual is apt to be more cheerful and more optimistic. During the minus fourteen day half of the cycle the individual is moody and easily irritated.

The intellectual biorhythm (shown on Figure 1 as a dotted line) is a 33 day cycle. During the plus half the individual is able to think more clearly; consequently, problem solving becomes easier as compared to the minus half of the cycle when the intellectual capabilities are lowered.

It would appear that the bottom most point of the lower half of the cycle would be the most critical time period. That, however, is not the case. Where each biorhythm crosses the reference (zero) line the particular cycle is passing through a transition phase. This time of transition during which the body's clocks are going through an abrupt change from a high to low (or vice versa) is by far the most critical time. Hence, they are called critical days and are exactly what the name implies. During these days we are more apt to misjudge our physical limitations, be extremely moody and irritable, and have a reduced ability to think clearly.

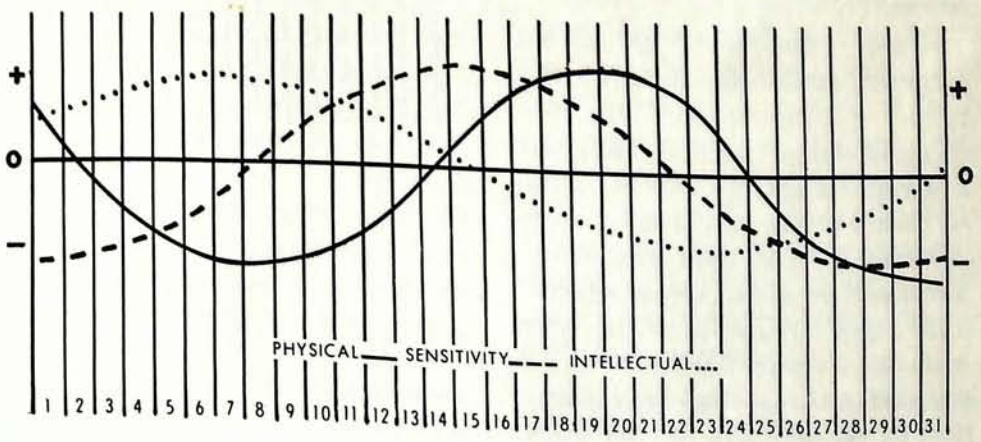

FIGURE 1- THE THREE BIORHYTHM CYCLES ARE PLOTTED AGAINST DAYS OF THE MONTH.

BIO WHAT ?

WHAT RELATION DOES BIORHYTHM HAVE TO ACCIDENTS ?

Several analyses have been compiled applying the Biorhythmic Theory to accident situations. Perhaps the most revealing analysis is referred to in the book, Biorhythm . . . Is This Your Day?, by George Thommen, which is, incidentally, the reference source for a great majority of this article. Mr. Thommen refers to a report compiled by Hans Schwing in Zurich, Switzerland, in which Mr. Schwing analyzed a total of 700 accidents using only the physical and sensitivity cycles. He found that 401 of these accidents (almost 60 percent) occurred on critical days.

To determine if the theory has any application to aircraft accidents, the necessary material to calculate the biorhythm cycles was locally purchased by the author. The material included a biorhythm computer termed a "Dialgraf" and the necessary computation tables based upon dates of birth and month and year of selected occurrence.

Using these tools, all aircraft accidents, attributable to either pilot factor or undertermined, that have occurred within TAC since 1969 were analyzed (except for four for which no birthdate of the pilots could be determined). The total sample was composed of 59 accidents wherein only the pilots involved were analyzed. Of those 59 accidents, 13 occurred on a critical biorhythmic day for at least one of the pilots involved. In 12 of the 13 accidents the pilot involved was either an IP, AC, or in a single place airplane. Not as significant, but still worth a mention, is the fact that in 40 (67 percent) of the 59 accidents at least one of the pilots involved had two or more biorhythmic cycles in the minus portion.

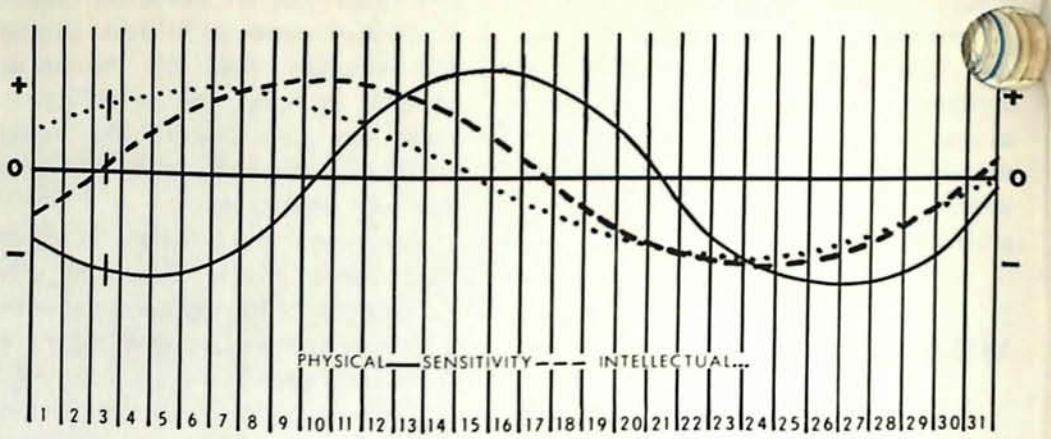

FIGURE 2- THE ACCIDENT OCCURRED ON THE THIRD DAY OF THE MONTH. NOTE THAT THE PILOT'S SENSITIVITY CYCLE WAS CRITICAL AND HIS PHYSICAL CYCLE WAS LOW.

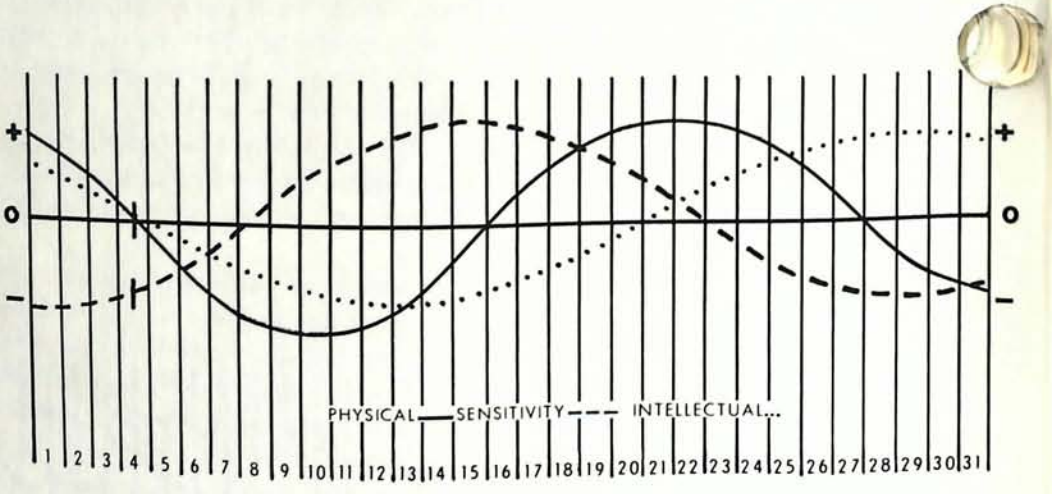

FIGURE 3- THE ACCIDENT OCCURRED ON THE FOURTH DAY OF THE MONTH. NOTE THAT THE PILOT'S PHYSICAL AND INTELLECTUAL BIORHYTHMS WERE CRITICAL.

Three accidents have been charted to show the biorhythm situation on the day of the accident. The first one (Figure 2) is a classic "get-home-itis" accident. The pilot attempted to fly in weather conditions for which his airplane was not equipped (ice) and subsequently crashed. He was attempting to get home for an anniversary celebration.

The accident occurred on the third day of the month. Note that on this day his physical biorhythm curve

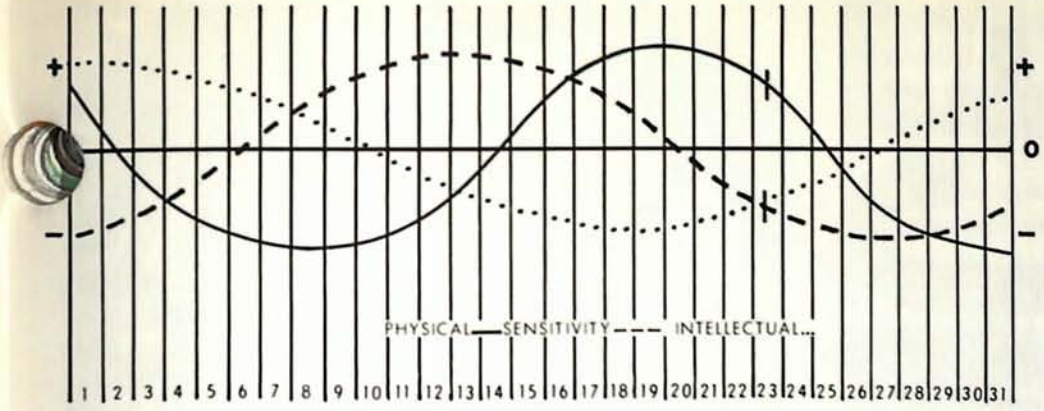

FIGURE 4- THE ACCIDENT OCCURRED ON THE TWENTY-THIRD DAY OF THE MONTH. WHILE NO BIORHYTHMIC CYCLES WERE CRITICAL, NOTE THAT THE PILOT'S SENSITIVITY AND INTELLECTUAL CYCLES WERE LOW, WHILE THE PHYSICAL CYCLE WAS HIGH.

(solid line) was low, indicating a physical condition less than optimum, and that his sensitivity curve (broken line) was critical. Could it be, that due to a critical emotional state, he let his emotions control his judgment and then when he got into trouble did not have sufficient physical reserves to cope with the emergency? By the way, his copilot apparently wasn't much help; he had a double critical day (physical and sensitivity) on the day of the accident.

The second example (Figure 3) involves a pilot who was engaged in ACM (Aerial Combat Maneuvers) tactics. In attempting to stay with his element leader, he failed to lower maneuvering flaps, lost control of the airplane and ejected. This accident occurred on the fourth day of the month. Note that on this particular day both the physical and intellectual biorhythm curves were critical. Could it be that his mental alertness was sufficiently impaired so that he forgot to lower the flaps and that when he lost control of the airplane his reactions were too slow to enable him to recover?

The third example (Figure 4) involves a pilot who crashed while on a close support mission. He falls into that "one of the best pilots in the outfit" category. The accident occurred on the twenty-third of the month. Note that on that particular day his physical curve was high while his intellectual and sensitivity curves were low. Could it be that he was operating in high gear physically but due to his degenerated emotional and intellectual condition he misjudged his physical abilities?

In each of the accidents let's recognize the other side of the coin. Specifically, that biorhythms had nothing whatsoever to do with any of them . . . they could have been caused by any combination of a hundred other factors.

Regardless of the side you choose the fact remains that in each of the accidents the pilot was tagged with the cause. Why? Accidents are inevitable, you say? Hogwash!! All accidents are preventable and all people are accident preventers. But when accidents are caused by people our investigations fall short of fully and completely determining WHY the accident happened.

HOW CAN A KNOWLEDGE OF BIORHYTHMS HELP PREVENT ACCIDENTS ?

If we were to chart our biorhythm cycles for each month should we stop flying when the curves start dipping into the minus area? Of course not! That would be a hell of a way to fight a war. But it would give us an insight into our own limitations.

We all have limitations of some sort and the good pilot recognizes his limitations and operates within them, at no detriment to the mission. Biorhythm would merely expand our knowledge of our limitations, and give us a set of identified parameters to work between . . . again at no detriment to the mission.

OKAY...WHAT NOW ?

The human factors side of accident investigations and causation is a fertile field. To say that nothing has been done in this area is preposterous . . . our accident rate alone shows that much has been accomplished. Our knowledge of how and why we do things is increasing every day . . . but we have a long way to go.

If we are to reduce accidents of all kinds to zero, then we must further explore the human factors area. Biorhythm may or may not be part of the answer. We may not yet possess the knowledge to provide the complete answer. There's a chance that we may not even possess a sufficient knowledge to ask the right questions. One fact remains. We must continue the search. →

SOURCES

1. **Thommen, George Biorhythm Is This Your Day? Crown Publishers, Inc., New York, N.Y., 1964.**
2. **Flight Safety Foundation, September/October Newsletter, 1971.**