PEAK PERFORMANCE FOR AEROBATICS

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Iowa State University Press / Ames

Contents

chapter four

Feedback

To successfully learn any aerobatic maneuver or figure, a pilot needs information about his or her performance, because without this feedback, learning does not take place regardless of the amount of practice. Without feedback the pilot does not know what the aerobatic figure looks like. From the pilot's cockpit view, information about performance is not readily apparent. Feedback for the aerobatic pilot is of two types: intrinsic (internal) and extrinsic (external), and the pilot must know the relationship between the two.

INTRINSIC AND EXTRINSIC FEEDBACK

Intrinsic feedback is information received as a result of the airplane's flight path and comes to the pilot via the sensory systems. Commonly called seat-of-the-pants flying, there are the sensations of G-load, sounds of the airplane, control positions, and visual pictures of ground references relative to the cockpit view. The cockpit visual reference accounts for 95 percent of the information needed to fly an aerobatic figure. This sensory feedback does not, however, ensure that a precise aerobatic figure has been flown. Even the most experienced aerobatic pilot cannot rely on intrinsic feedback as an indicator of precision. Extrinsic feedback is needed for an accurate picture of the aerobatic figure.

Extrinsic feedback is given by a ground observer who determines the shape of the aerobatic figure. Such feedback serves two major functions.

First, it provides the pilot with information needed to focus on the details of his or her performance. Without this focus there will be no improvement in performance. Second, extrinsic feedback provides information on the flight path of the figure, which in turn allows for correction of errors. This is critical for competition aerobatics since the nature of the scoring system is subjective evaluation of an aerobatic figure relative to an established criterion.

There are three methods for providing extrinsic feedback to an aerobatic pilot. First, feedback can be given via radio to the pilot as the figure is flown. The value lies in the pilot being able to immediately relate the extrinsic ground view to the intrinsic cockpit picture. The disadvantage is the danger of providing so much information that the pilot is in overload, receiving so much information that it cannot be assimilated. The pilot must be in the intermediate phase of motor learning for the particular aerobatic figure in order that this method be effective.

Second, extrinsic feedback can be done verbally by tape recorder and even accompanied by a video. Following the flight, audio input from tape or visual input from video allows for a detailed analysis with no danger of overload, but the pilot must remember how the figure appeared from the cockpit and relate this to the tape or video. Without this relationship, delayed feedback is of little value. In addition, the delay between performance and feedback must be minimal. The pilot's perception of a flight is the most vivid immediately after the performance. Memory of the cockpit view fades rapidly after the flight.

Finally, a combination of these two methods can be used. Trial-error experience has shown this to be the best method. It is, however, very time consuming and requires a total focus on the part of the pilot in order to relate extrinsic information to intrinsic perceptions. It seems to work best if the pilot is in at least the late intermediate phase of motor learning relative to the figure being flown.

CRITIQUER VS. COACH FEEDBACK

A successful aerobatic performance is determined by the correctness of the airplane flight path relative to a subjective standard. Providing a pilot with information about the appearance of an aerobatic figure requires a critiquer. However, the ability to analyze what is being done wrong and how to correct it demands an understanding of flying techniques, and this requires a coach.

Critiquing feedback identifies the errors in an aerobatic flight path, whereas coaching feedback identifies the pilot technique needed to correct

the error. Hence, it is useful to define a critiquer's purpose as grading a figure relative to competition standards, and to define a coach's function as finding what is wrong and determining what pilot skills are needed to correct the problem. While a critiquer and coach may be the same person, they can effectively be two different individuals. This difference is important in providing feedback. A good critiquer and a good coach do not serve the same purpose and, as such, are not necessarily the same person.

The role of the critiquer is to define an aerobatic figure as flown by a pilot relative to the established standards set forth by the rules for competition aerobatics. However, the interpretation of these rules is subjective. Consequently, different critiquers usually provide different feedback to the pilot, something that is detrimental to pilot performance. As one well-known aerobatic pilot once told me, "It's not what the pilot does, it is what the critiquer (judge) thinks the pilot does." In other words, it is what the critiquer (judge) thinks he or she sees.

What a critiquer or judge sees involves two processes. First, there is the acquisition of visual data. This is an anatomical and physiological function of the eye whereby light is received by receptors in the retina and signals are sent via nerves to the brain. Second, the brain interprets these signals based on past experiences and produces a visual perception. While visual acquisition is a mechanical process, perception is learned. Consequently, the same visual data may have a different perception for different people.

For example, consider a plain-vanilla 45-degree up-line as the opening figure in an aerobatic sequence that is flown directly in front of the judges. Of the five judges, two say the line is steep, two say the line is shallow, and one says the line is perfect. The spread of points between high and low for the five grades is four, yet all five judges were looking at the same figure. All saw the same figure, but perception was not the same. This is an educational problem for the judges. Nonetheless, this sends a confusing message to the pilot.

To some degree this confusion can be resolved if the pilot's critiquer or coach, preferably both, grades the flight. These observations can be compared with those of the judges. In turn, these observations are compared with the pilot's perception of the flight. It must be remembered that perception is a learned process; hence, the pilot must be part of the feedback loop. The critiquer and/or coach may need to evaluate their standards for the figure and, if changes are in order, redefine feedback standards. Likewise, no changes may be in order. The biggest danger of mixed feedback messages is to the pilot's motivation because such feedback leads to frustration, loss of motivation, and eventually, a defeatist attitude.

While critiquer feedback is error identification relative to the competition standards for a figure, there is a three-step process for providing coaching feedback to an aerobatic pilot. The first step is to determine if the pilot has the correct basic understanding and technique for flying the figure. This is absolutely critical during the basic phase of motor learning because, without this correct understanding, practice during the intermediate phase will develop incorrect skills that become increasingly difficult to change. To avoid this scenario, the pilot must have a mental picture (extrinsic view) of what the figure is suppose to look like to the critiquer or judge.

The second step is to select one error at a time to correct. This should be the error that is easiest to correct and will lead to the most improvement. Usually, this is the most obvious error. The improvement motivates the pilot to work toward higher standards of performance.

The third step is to determine the cause of the error. While the coach can identify the error and suggest correction, the pilot must execute the correction. This is sometimes the most difficult correction to make simply because every airplane, even if the same make and model, has different flying characteristics, and even though these differences may be slight, the pilot skills needed may be significantly different.

This three-step procedure is repeated until the pilot has minimized the errors, at which time the figure approaches perfection. During this correction process the pilot progresses into the advanced phase of motor learning, in which flying technique becomes an automatic motor function requiring little conscious thought.

It should be noted that if a pilot does not show some improvement in the correction of the error within three attempts, there is no need for additional attempts until the correction needed is reviewed by the pilot and coach. To continue to repeat the error makes correction more difficult because the pilot is simply practicing the error.

This process will not work if a complete sequence is flown repeatedly. The sequence must be broken down into segments and individual figures. These are then practiced by the block, random, variable, whole, and part methods. In order to be motivated to improve, the pilot must experience progress. With these methods progress is more easily recognized.

POSITIVE AND NEGATIVE FEEDBACK

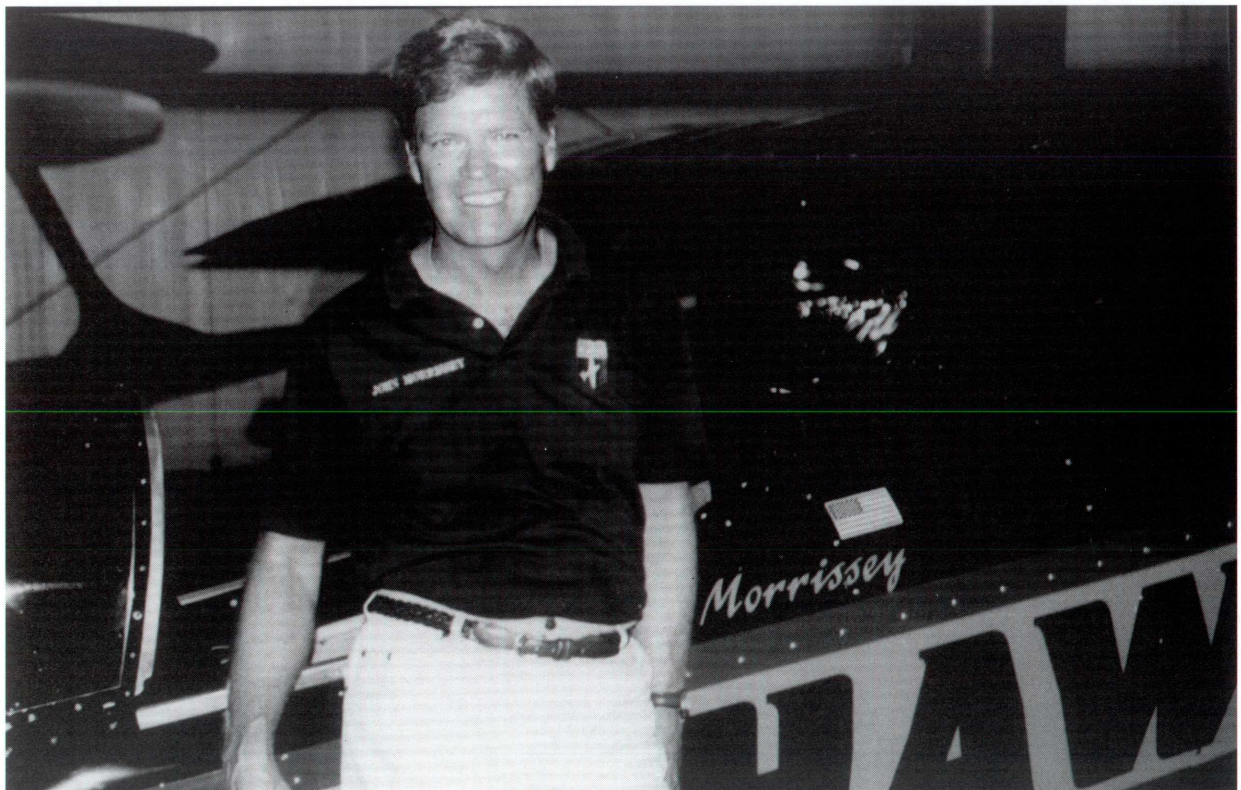
Traditionally, the critiquer system of feedback is used almost exclusively by the aerobatic pilot simply because of the nature of the scoring system for competition aerobatics. Such feedback is a punishment type, a neg-

ative type of feedback, something that has been repeatedly shown to have detrimental effects on learning a physical skill. This can be countered, however, by including in the feedback that information about the figure which is good, a positive feedback. Such positive feedback has repeatedly been shown to produce better performance.

A method of providing feedback that serves the aerobatic pilot well is to have two critiquers provide feedback for the same figure or sequence. Each provides the feedback via a tape recorder, but one tells the pilot what was done wrong (negative) and the other tells what was good (positive). The pilot reviews the negative comments first, concentrating on the correction, not the mistake. This is followed by review of the positive comments. This positive information is combined with the corrections needed, not the mistakes, which are derived from the negative feedback. This combination of positive and negative feedback leads to motivation to improve.

Although the aerobatic scoring system is negative in nature, positive feedback, information on good aspects of the aerobatic flight, tends to motivate the pilot. Motivation in turn improves pilot focus.

To this point, the word *focus* has been used repeatedly, and while it has been only briefly defined, it is an essential element in combination with practice and feedback that results in peak performance.



John Morrissey, U.S. team coach and pilot. (John Morrissey photo collection)