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PILOT SKILLS TO MAKE "LOOK-OUT" MORE EFFECTIVE IN VISUAL COLLISION AVOIDANCE

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1. INTRODUCTION

1.1 The practice of "see-and-avoid" is recognized as the primary method that a pilot uses to minimize the risk of collision when flying as an uncontrolled flight in visual meteorological conditions. "See-and-avoid" is directly linked with a pilot's skill at looking about outside the cockpit or flight deck and becoming aware of the surrounding visual environment. Its effectiveness can be greatly improved if the pilot can acquire skills to compensate for the limitations of the human eye. These skills include the application of effective visual scanning, the ability to listen selectively to radio transmissions from ground stations and other aircraft to create a mental picture of the traffic situation, and the development of habit patterns that can be described as "good airmanship".

1.2 This circular aims to make pilots aware of the skills required to make "look-out" more effective and is directed mainly towards those pilots who do most of their flying under visual flight rules (VFR). The skills should be of interest to all pilots, however, regardless of the type of aircraft they fly and the flight rules under which they fly since no pilot is immune to collisions.

1.3 A study of over two hundred reports of mid-air collisions showed that they can occur in all phases of flight and at all altitudes. It may be surprising that nearly all mid-air collisions occur during daylight hours and in excellent visual meteorological conditions. While the majority of mid-air collisions occurred at lower altitudes where most VFR flying is carried out, collisions can and did occur at higher altitudes. Because of the concentration of aircraft in the vicinity of aerodromes, most collisions occurred near aerodromes when one or both aircraft were descending or climbing. Although some aircraft were operating as instrument flight rules (IFR) flights, most were VFR and uncontrolled.

1.4 The pilots involved in the collisions ranged in experience from first solo to 15 000 hours of flight time, and their reasons for flying that day were equally varied. In one case a private pilot flying cross-country, legally VFR, in a single-engine aircraft collided with a turboprop aircraft under IFR control flown by two long-time experienced airline pilots. In another case, a 7 000-hour commercial pilot on private business in a twin-engine aircraft overtook a single-engine aircraft on its final approach piloted by a young flight instructor giving dual instruction to a non-soloed student pilot. Two commercial pilots, each with well over 1 000 hours, collided while ferrying a pair of new single-engine aircraft; and two private pilots with about 200 hours logged between them collided while on local pleasure flights in small single-engine aircraft.

1.5 There is no way to say whether it is the experienced or the inexperienced pilot who is more likely to be involved in a mid-air collision. While a novice pilot has much to think about and so may forget to maintain an adequate look-out, the experienced pilot, having flown through many hours of routine flight without spotting any hazardous traffic, may grow complacent and forget to scan.

1.6 If you learn to use your eyes and maintain vigilance through proper awareness, it will not be difficult for you to avoid mid-air collisions. The results of studies of the mid-air collision problem show that there are certain definite warning patterns.

2. CAUSES OF MID-AIR COLLISIONS

2.1 What contributes to mid-air collisions? Undoubtedly, traffic congestion and aircraft speeds are part of the problem. In the head-on situation, for instance, a jet and a light twin-engine aircraft may have a closing speed of about 1 200 km/h (650 kt). It takes a minimum of 10 seconds for a pilot to spot traffic, identify it, realize it is a collision threat, react, and have the aircraft respond. But two aircraft converging at 1 200 km/h (650 kt) will be less than 10 seconds apart when the pilots are first able to see each other!

2.2 These problems are compounded by the fact that air traffic control and radar facilities are, in some cases, overloaded and limited.

2.3 These factors are all contributory causes, but the reason most often noted in the mid-air collision statistics reads "failure of pilot to see other aircraft" — in other words, failure of the see-and-avoid system. In most cases at least one of the pilots involved could have seen the other in time to avoid the collision if that pilot had been watching properly. Therefore, it could be said that it is really the eye which is the leading contributor to mid-air collisions. Take a look at how its limitations affect your flight.

3. LIMITATIONS OF THE EYE

3.1 The human eye is a very complex system. Its function is to receive images and transmit them to the brain for recognition and storage. It has been estimated that 80 per cent of our total information intake is through the eyes. In other words, the eye is our prime means of identifying what is going on around us.

3.2 In the air we depend on our eyes to provide most of the basic input necessary for flying the aircraft, e.g. attitude, speed, direction and proximity to opposing air traffic. As air traffic density and aircraft closing speeds increase, the problem of mid-air collision increases considerably, and so does the importance of effective scanning. A basic understanding of the eyes' limitations in target detection is probably the best insurance a pilot can have against collision.

3.3 The eye, and consequently vision, is vulnerable to many things including dust, fatigue, emotion, germs, fallen eyelashes, age, optical illusions, and the effect of alcohol and certain medications. In flight, vision is influenced by atmospheric conditions, glare, lighting, windshield distortion, aircraft design, cabin temperature, oxygen supply, acceleration forces and so forth.

3.4 Most importantly, the eye is vulnerable to the vagaries of the mind. We can "see" and identify only what the mind permits us to see. A daydreaming pilot staring out into space is probably the prime candidate for a mid-air collision.

3.5 One inherent problem with the eye is the time required for accommodation or refocusing. Our eyes automatically accommodate for near and far objects, but the change from something up close, like a dark instrument panel two feet away, to a well lighted landmark or aircraft target a mile or so away, takes one to two seconds. That can be a long time when you consider that you need 10 seconds to avoid a mid-air collision. (See Figures 1 and 2.)