

## CHECK LISTS

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No question, it's important to use check lists -- and to have them correct and up-to-date besides! -- but you must use them the right way! Ideally, the check list is a way to direct the conscious, focused attention to each critical item in turn, momentarily providing for each what some German philosopher called "der Begriffe der 'Achtung'" (the grabbing of the attention). But, it's absolutely bad to use the list as some kind of step-by-step "recipe" or "program" for accomplishing each stage of a flight, as some people do!

The problem is that the conscious mind may not always get past the words on the check list to see what's really there. Or it can get distracted, make clerical errors, and miss things. You really do want to know, for yourself, out of your own inner competence, your haptic memory, and your habit patterns, what it is you're trying to do, and thus have an independent, hands-on, almost instinctive knowledge of all the things you need to accomplish. A canned list, no matter how comprehensive, should only be used as a way to check what you've done (or are about to do).

Of course you may use a check list as a learning aid to pick up what you need to know about a particular airplane, but it shouldn't be driving the process of getting the machine safely into the air and down again, and you should not wind up dependent on it. There are too many "yes, but's," and too many ways for things to jump the tracks. There's no way to build into a check list all those very important non-verbal things that go into flying -- the way something sits, the way the sky looks, what happened last Tuesday -- the little signs that say you need to pay particular attention! You need to internalize all these things about flying, so that your non-verbal, "hands-on" mind will be constantly attending to all this important stuff too, along with your conscious mind. These non-verbal things are built into your hands, your guts, or the seat of your pants, and may only be represented upstairs by a hard-to-explain, non-verbal mental map. For fundamental safety at any stage of flight, including those times when things aren't working out, you want to be operating mostly from this built-in sense of the real requirements. You really, really don't want to be scrabbling around in a list!

In the past, we've had people who, being conscientious and all, would punctiliously go through their check-lists, but lacking this sense of how things really worked, or what had to happen down way down there at the perfectly dumb, physical level, they would miss incredible things. Their thinking would simply stop once they had ticked off the item on their list. If Kant had been a pilot, he would have said that these people weren't paying attention to "das ding an sich" -- the thing in itself. I used to think such folks had a weird disconnect between their intellect and their survival instincts, or that maybe they were just overly susceptible to brain-farts. But the neuroscientists say that there are a number of ways such derailments can (and do) occur.

The first is that *it is extremely difficult to see anything that you don't expect to see.* Basically, when you're looking for something, if your guidance system has been fed a less-than-ideal "search image," you're not going to see it! We've all encountered this "can't see for looking" phenomenon when searching for lost objects. The same thing

occurs all the time in science and invention. Art-theoreticians like E. H. Gombrich have found many fascinating examples in representational art. The earliest “old master” artists flat-out couldn’t see what was later obvious to everyone, once it was known what to look for, or how to render it. (This works the other way too. In the grip of a seriously wrong mental picture, the old artists would add details that “just had to be there” but weren’t, like a suit of armor on a rhinoceros drawn from life – or, maybe, in the case of a pilot, the idea that the fuel valve just had to be open.)<sup>1</sup>

Therefore, it’s not enough just to batten onto the item as a word appearing on a list. It’s important to have a correct mental representation of the actual discrepancy you’re trying to catch, and what it might mean, so that you won’t blow right past it without realizing that you’re looking at the very thing that might do you in!

A second way for things to get missed is that, visually, you can only pay attention to one thing at a time. The example usually given is that of a group photo full of faces. When you look at it, you indeed see all the faces, but you will not immediately recognize, for example, that one of them is yours, unless you search individually from face to face. Also, since high-level brain processing time is scarce and access to it highly competitive, if you happen to be paying attention to the wrong face, all the faces around the one you’re looking at will get completely blanked.

So, in running a check list, you do need to stop just a moment on each item to concentrate on the *thing itself* (not the word, not the abstract concept!) and fully register what you see (together with its deviation, if any from what you were expecting), just as you do when scanning your instrument panel. You also need to realize that if you inadvertently fixate on something, or divert your attention elsewhere, a critical item may get blanked.

*You also need to prioritize.* In normal times, you may want to check all kinds of miscellaneous things down to the last detail, but when it comes to the basics, you want to be *damned sure they’re right!* Similarly, in tough situations you may need to jettison all the less important stuff, like talking on the radio, and concentrate on just the very few things that are going to get you safely through the next two or three minutes! In other words, you must never clutter your head with too much detail or undifferentiated crap, and in a real jam, you need to “fly the airplane first” and let all the non-essentials go by the boards! (This, of course, means learning what the essentials *are*.)

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1. For example, how could someone go through his preflight check, and yet roll into position with the fuel valve off? This actually happened some years ago! (It was caught by the API co-pilot.) Even if this fellow had mis-read a step of the check list, or got distracted, you would think his non-verbal hind-brain would kick in with dumb, non-verbal, survival thoughts on the order of “Takeoff! Ugh! If Bird stalls, might as well be up there in Toyota! If Engine quit, have to stack it somewhere ahead! Engine better not quit!” Then, looking at the important things with a last confirmatory glance, “Urk! Gas valve off! Need to snatch cookies!” and he would have automatically fixed anything as grossly wrong as that!

(Later he might shiver and question his true competence, but he would have survived!)

Another subtle mental effect is “change blindness.” When it occurs, you think you’re still seeing the stable world full of coherent objects you’ve become accustomed to, but if your attention does not specifically land on the object that has changed, you will not find it, even though it might be right there in front of your eyes. This is usually demonstrated by showing people pairs of fairly cluttered pictures in which some detail has been subtly (or not-so-subtly) altered, and asking them “What changed?” Without a clue about what to look for, most people are damned if they can see any difference between the pictures!

So, realize that you too are subject to change blindness and use your check list *and* your sense of priorities. Look at what’s really important in some detail, and be sure it’s right before “flinging yourself in the air.” Be sure you’re actually going to notice the little differences between the thing that was OK the last 50 times you looked at it, but this time is sitting there broken, bent, or missing!<sup>2</sup>

How else to defeat such problems? A first thought is that, despite the recent (and obviously excellent) introduction of complete official API check lists based on the POHs, it’s still important to make your own as a learning exercise, and to memorize for yourself the main points via brief mnemonic aids like “gumps,” for example. Once you’ve done that, you may want to use the official check list (indeed, you *should* use it) -- but by having previously made your own list, you will have begun the process of really learning to fly the airplane inside your head, and you will not wind up using a convenient list made by others as a crutch. Based on your own needs and makeup, you might want to add certain items to the official list, but you should avoid overloading it (or your head) with miscellaneous items that could get in the way.

Pursuing the thought a little further, what you need to develop is a highly-integrated, non-verbal, internal representation of what you’re trying to do. This is not so much a memorized check list as it is a working mental model of all the dumb, physical processes underlying the flight you’re about to undertake, together with the interactions of the actual parts and surfaces with the air. If you have such a working model inside your head, you will instinctively catch and fix your mistakes (something we all do in other walks of life. No one, for example, ever forgets how to ride a bicycle!) A good mental model won’t let you screw up if you miss something when running the check list, (just as using the check list should prevent your screwing-up via some unsuspected gap or momentary lapse in your mental model).<sup>3</sup>

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2. These points of neuroscience were extracted from replies by J. Wolfe, Harvard Visual Attention Lab, Harvard Univ., and H. Duncan, MRC Cognition and Brain Sciences Unit, Univ. of Cambridge, UK to the question of why we “Can’t See for Looking”. “New Scientist” Vol. 180 No. 2418 pg 81, Oct 25, 2003.

3. I have no neuroscientific authority for this concept, but I’m pretty sure it’s valid.

Developing this internal competence is like learning to perform a piece of music. To play well, a musician needs to learn the notes and how to play his instrument to be sure, but beyond that, what he really must do is develop a good sense of "how the music goes." Then, as he plays, he must pay careful attention to his fellow musicians, and judge how the piece is going, the effect on the audience, and many other things that aren't on the sheet-music in front of him (on his "check list," if you will). He will still be using it, of course, but he won't be depending on it for step-by-step guidance through the piece. If all goes well, he will carry his audience with him and achieve the performance he's after -- but even if a string breaks, or someone blows a few clams, or the sheet music falls on the floor, he can still get his audience from "here" to "there," without suffering a complete train-wreck!<sup>4</sup>

And so it is in flying: Flying, too, is a performance art. There's a need to start with everything tuned and checked. There's a beginning, a middle, and an end, and along the way, a need to judge how well it's going, and to catch and fix the things that aren't right. You want each phase of a flight to proceed with "the outcome never seriously in doubt" - even if all hell breaks loose and the check list literally or figuratively gets sucked out the door!

*So, always use your check list*, but use it to backstop your own internal competence, which consists of having a truly serviceable mental picture of what you're trying to accomplish. Use it to help you, but first be sure you're paying your own close attention to the very real things that underlie the operation of the dangerous machine you've got strapped to your bottom.<sup>5</sup>

Never forget: "Fly the Airplane First!" Check list or no check list, be sure you can at least do that! Such is the pilot's art!

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4 . Compare the difference between the performance of a good musician and the performances of untalented or poorly- taught kids at a typical neighborhood piano recital. Even if they can hit all the notes, their rote, unthinking, note-by-note renderings of the printed music sitting in front of them are just excruciating! Don't fly like that!

5. For example, you're supposed to taxi on the yellow line. But if it's going to lead you across drain grates, over disintegrating pavement, or too close to snowbanks, then think of your prop, and *don't* stay on the yellow line! A trivial example, perhaps, but in flying, you never want to be "functionally-fixed"!