

## Uptime: Checklists — Often Overlooked Tools

Written by Bob Williamson, Contributing Editor  
Monday, 01 March 2010 15:19

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“What d’ya think I’m stupid? Checklists are for dummies.” “I know what I’m doing...done it for years. Why would I ever need a checklist?”

I continue to be amazed at the resistance of maintainers and operators when I suggest the use of checklists for critical tasks. Maybe it’s just me. I make lots of lists and check things off as I go through a “normal” (or abnormal) day on the job. When I was taking pilot training, the use of checklists was drilled into my brain. In my 17 or so years studying NASCAR race teams, I’ve seen thousands of checklists being used by highly skilled people every day. Are checklists part of your reliability improvement toolbox?

### What are checklists?

In many cases, checklists are “*mnemonic*” (yes, the “m” is silent) devices that act as a memory aid or a learning aid.

First, there are “verbal mnemonics” that help us remember things. “*Roy G. Biv*” helps us remember the sequence of colors in a rainbow (

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*V*

iolet). Then there’s the poem we use to remember the number of days in each month:

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*30 days has September, April, June and November...*

“*Visual mnemonics*” include acronyms such as SCUBA (self-contained underwater breathing apparatus) and TPM (Total Productive Maintenance). Spelling lessons in school also use visual mnemonics. The words “principal” and “principle” can often be confused. So, the “

*Principal can be your pal*

” helps sort out which word refers to a person and not a basic truth, law or assumption. The checklist also is another form of

*visual mnemonic*

since it

*visually*

reminds us of what to do, or lists a sequence of events.

There are several different types of checklists to consider. Here are the two most common for our line of work:

- The laundry list
- The sequential list of events

### **The laundry list**

The “laundry list” is used to make sure all of the items are gathered and sorted. One example is an order pick list used in warehouse distribution centers. A grocery-shopping list is another example, when picking up specific items is important. A good illustration of the use of this type of checklist can be seen in the area of race-car preparation:

**NASCAR race teams** use a “laundry list” form of checklist to stock the hauler truck. Furthermore, to finish preparing a race car to leave the shop for the race track, a large one-page checklist covers all of the major areas of the race car and lists everything that must be completed in each of the following areas: Front suspension, rear suspension, drive train, wiring, interior, brakes, fuel system, etc. Everything must be checked, prepared, assembled and signed off for the car to be completed and the checklist to be removed from the race car.

### **The sequential checklist**

The “sequential” checklist not only itemizes all of the important tasks but places them in an order of task performance. While a detailed “procedure” defines *how* all critical tasks are to be

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performed, the checklist provides an ordered summary of each critical task or step in the procedure. Here are some examples, from airplanes to health care:

**Aircraft pilots** use the sequential type of list every time they prepare to fly and throughout the entire flight operation. Yet, pilots did not always use checklists. Their beginning dates back to something that occurred in 1935, at Wright Field in Dayton, OH. Even though its proposed aircraft was the U.S. Army's favorite, Boeing lost a competitive bid to Douglas Aircraft because of a takeoff crash during a final flight test (leading to the unfortunate label of "too much airplane for one man to fly.") Despite a highly experienced flight crew, the cause was attributed to pilot error. Subsequently, the Boeing pilots got together and developed checklists to ensure everything would be done and nothing overlooked in the future. These checklists covered takeoff, flight, before landing and after landing. Using them, the crews flew over 9200 hours (1.8 million miles) without a serious accident. The Army eventually ordered 12,731 of these B-17 "Flying Fortress" aircraft. Today, pilots and flight crews use checklists during every phase of flight from pre-flight to powering down after landing.

In addition to checklists, countless small-aircraft pilots also use various verbal/visual mnemonics. For example, an emergency-landing checklist is summarized as "*FIELD*" (Fuel off,

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gnition off,  
*E*  
lectrics off,  
*L*  
ap-straps tight,  
*D*

doors open). This outlines a critical sequence of tasks and is NOT a replacement for pilot training and qualification.

**Medical checklists** are used because mistakes can and do happen in the world of high-tech medicine— *mistakes that can result in serious complications or death*. Dr. Peter Provonost, a critical-care researcher at Johns Hopkins University, was concerned about the 10% hospital-acquired infection rate, killing 90,000 patients and costing \$11 billion per year. He concluded that posting a simple five-step checklist chart reminding physicians of each step in a routine would dramatically reduce medical errors and infections. Here are the five steps to reduce infections in an ICU procedure:

***Doctors should...***

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1. Wash their hands with soap.
2. Clean the patient's skin with chlorhexidine antiseptic.
3. Put sterile drapes over the patient.
4. Wear a sterile mask, hat, gown and gloves.
5. Put a sterile dressing over the catheter site.

### **Resistance...**

Early experiences with this five-step "Doctor's Checklist" indicated three reasons that physicians and hospitals "could not implement this checklist procedure." First, some doctors were insulted, their egos hurt. Second, staff felt they were already too busy and that more bureaucratic tasks would get in the way. Third, such "*mundane*" research was ignored in favor of the more exciting issues. But, if infections and deaths could be prevented, the resistance had to be overcome.

### **Actual results...**

One hundred Michigan hospitals began using Provonost's checklists in ICUs in 2003. Within three months, hospital-acquired infections dropped from 2.7 per 1000 patients to zero. More than 1500 lives were saved during the first 18 months. Along with the checklists, physicians were trained in checklist function and use; and supply carts were standardized and controlled for one-time use. A culture change also occurred: Doctors and clinicians no longer believe that infections are *inevitable*, but rather are *preventable* using very simple procedures. (This University of Michigan study was published in the *British Medical Journal* in February 2010.)

### **Making your own M&R checklists**

Checklists are NOT the starting point for improving equipment performance and reliability. They merely summarize critical tasks or steps that are covered in detailed procedures and training. They serve as visual cues or reminders of important points learned in training sessions. Errors made by skilled and knowledgeable people—*not just trainees*—happen every day in today's workplace. Still, they can be avoided. Start your consideration of checklist development by asking these questions:

1. **"Do the consequences of failure justify the use of checklists to help prevent human error?"** Will errors result in penalizing personal injury, environmental incidents, costly defects or off-quality production, equipment damage, overly lengthy or incorrect repairs, lengthy or inaccurate changeovers?

2. **Are the detailed "how to" procedures accurate and complete for the critical tasks?** If so, checklists should be developed to help assure compliance to the procedure.

Keep things simple. Checklists should NOT be confused with *procedures*. Complex procedures with detailed descriptions of each task are sometimes required. These can be formatted much like a checklist in a multi-page document or manual. However, most checklists are a single page (OK, some pages are larger than others) containing key tasks only with a check box or a blank for the person's initials. Moreover, remember, checklists are used by experienced and qualified people and are not a substitute for training.

Here are a few examples of checklists that can be used to improve maintenance and reliability:

**Parts kitting.** A “parts kit list” for a work order helps improve maintenance efficiency and effectiveness. All of the parts needed for the maintenance job are gathered and put in a secured place before the work is scheduled. There is no sequence or order to this type of list. Just make sure all of the stuff needed to complete the job is gathered in one place and checked off in the process.

**Checklists for accountability & hand-off.** Some checklists serve only as reminders or visual cues of tasks and sequence; the only accountability relates to them being followed as written, such as with a “*Startup Checklist*.” In the case of repair and maintenance checklists, it may be important that each item be checked or signed off as it is performed. The initials of the person performing the task allows follow-up to issues or questions. These initials also can be helpful when handing off a lengthy procedure to a follow-up crew or maintainer to complete a job already underway.

**Checklists as historical reliability records.** Some maintenance checklists are sequential and have critical measurements that must be made, verified and/or recorded. These should possess the “accountability” as described above, as well as the actual readings or measurements made. In some cases such checklists should contain certain “GO/NO GO” conditions, specification or criteria.

The bottom line here is that most reliability problems are caused by people making errors or overlooking proven maintenance and reliability techniques during the machine's life cycle. Checklists help save lives and make race cars and aircraft safe and reliable. Why not make

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them a vital part of your M&R toolbox and lead the culture change today? **MT**

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