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The Controller Memory Guide

Concepts from the Field

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16. Abstract

Memory is an elusive human ability which both helps and hinders air traffic controllers' performance. This document was developed based on the ideas of controllers themselves when they were asked what they did to manage their memory resources. The guide is a job aide meant to help controllers think about what they do and about the little things they could use to help them reduce the possibilities for errors based on memory lapses. The material is presented in graphical cartoon format along with a very direct and minimalized text narrative.

The goal was to provide the concepts in a readable format that controllers could review when they had the time. The issues covered in the guide all relate to memory in one way or another, but in many cases transcend memory issues alone, and look at the more basic issue of any person-machine system performance. Human and system performance are the bottom line in any complex command and control system such as air traffic control.

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Don't try to memorize everything possible. Organize your material and know where you can look up answers to questions which are less time critical. Reserve your working memory for thinking, planning, and problem solving.

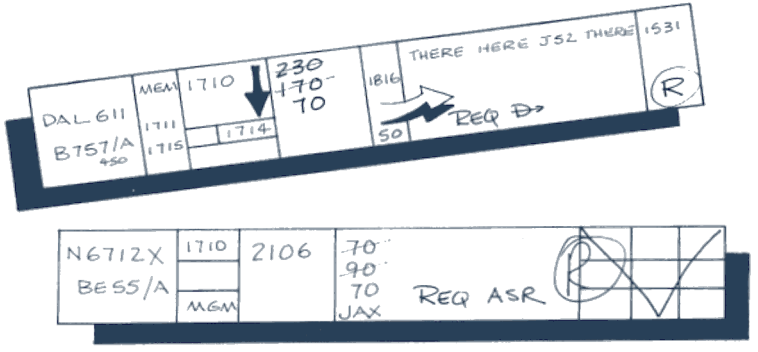
Memory is a limited resource. Don't depend on it any more than you have to. If you are not sure of your facts, check and recheck. Use your resources wisely.

Listen closely. Two heads can be better than one. Get organized. Communicate. Learn to depend on and help each other.

There is a time for change. Use the technology that you have; don't ignore it. Technology, used properly, can reduce the load on your working memory.

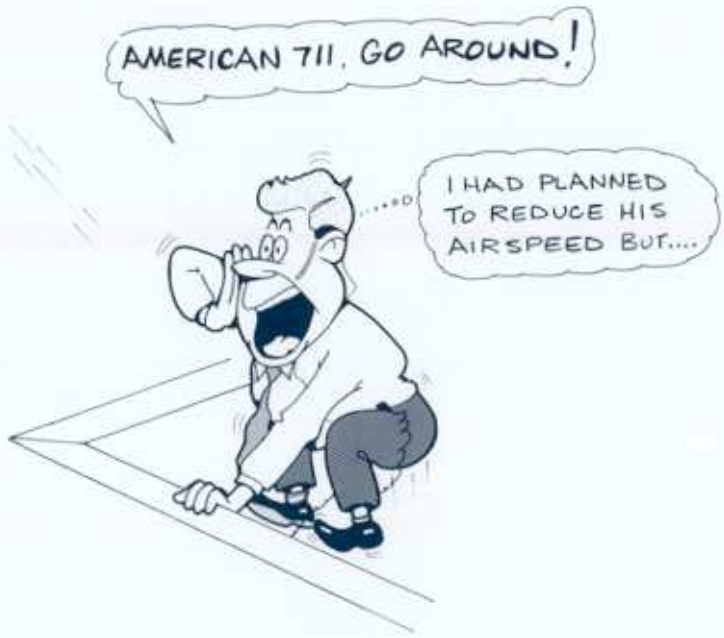
Use any special reminder tools that work for you. Something as simple as a piece of tape can help you keep track of things when you are busy. You can write critical elements of data on it, or the tape itself may remind you that, for example, the left parallel runway is closed.

When you change something, don't expect to remember that you did it. Make a note so the change will not come back to haunt you!



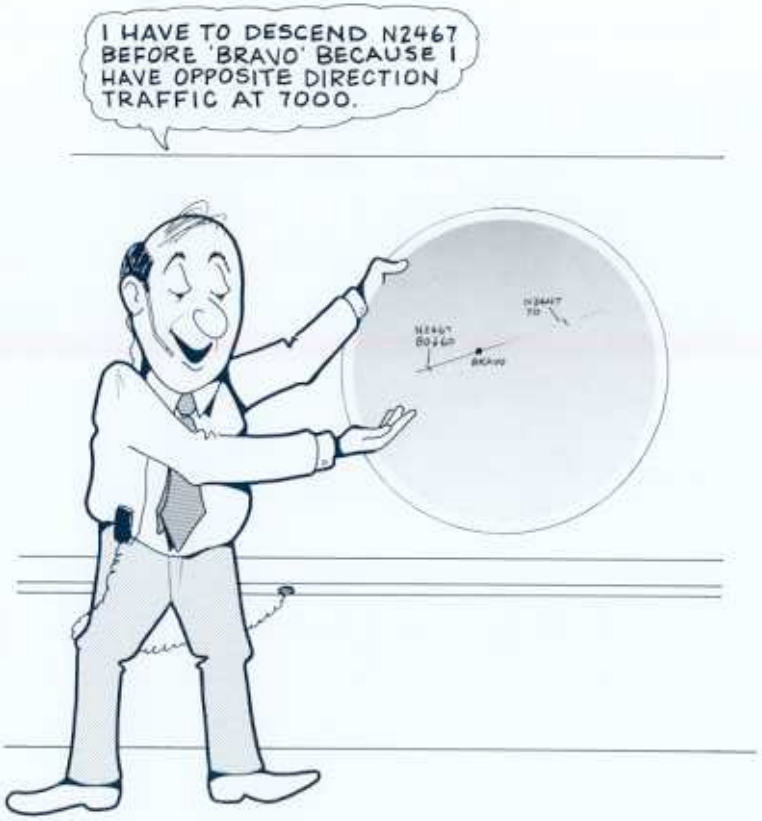
There is nothing magic about good strip marking. Just do it the way you were taught and do it consistently.

When you are trying to learn something new, it can sometimes help at the beginning to break it down into smaller bites. The better you learn it, the less time it will take to retrieve the details when you need them, and the more time you will have for problem solving and planning.



Prospective memory is when you plan to do something and store that plan in memory. Sometimes we forget parts of our plans. If this is a problem for you, do one or both of the following things: reduce the number of steps in you plans; use notes, strip cocking and/or marking to make sure all the pieces are there.

Mnemonic devices are like code words that help you remember. You probably learned some mnemonics in training. Examples include: (FIT) - First Identify Targets, and (HAC) - Heading, Altitude, and Clearance. Use mnemonics to help you remember data that you need repeatedly.



Organize, plan, and develop a strategy for the airspace and special conditions. Many controllers find it helpful to verbalize their decision rules to themselves.

Complete the transaction. Don't defer it to later when you may forget the details. Solve the problems that you know about now. Later, they may be more difficult.

Some people find it helpful to visualize the situation as they speak. You can use this as an opportunity to revise and improve your "picture."

Fatigue and stress reduce your working memory. That is the part of memory you use to think and solve problems. When you are tired or overwhelmed, things can get out of control. Know what your limits are! Get enough rest! Leave personal problems outside the control room!

Good planning reduces memory load. Planning should be a continuous process. Keep a record of any changes you make to your plan.

If you don't see it, you can't remember it. Scan With A Plan (SWAP). It does not matter what position you are working. Keep that head and those eyes on a swivel, and do it systematically.

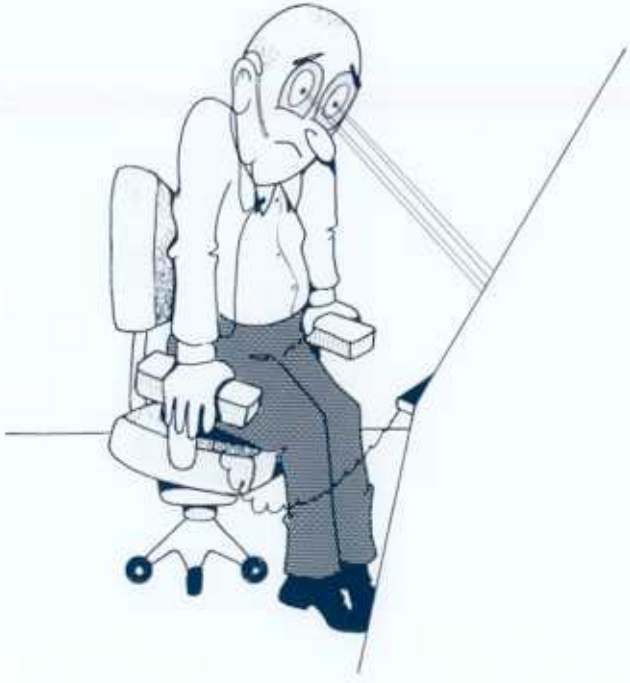
Set priorities and follow them. If you lose sight of your priorities, you can be overloaded. Working memory can fail when you are trying to do too much and exceed your capabilities.

You can't assume that low traffic means good memory. Most mistakes are made at low and moderate task load. Use the tools available to you so you will not be heard saying, "I forgot"!

People do not learn passively. The controller who actively works at storing the data is more likely to have what he or she needs when it is needed.

Most errors occur early in a shift or after a break. Take time with your relief briefing. Use the checklist. Make sure that the relieving controller has data he/she needs in working memory. This means that they are actively aware of it.

Keep up that scanning and don't get tunnel vision. If you don't see it, you can not put it in memory and work with it.

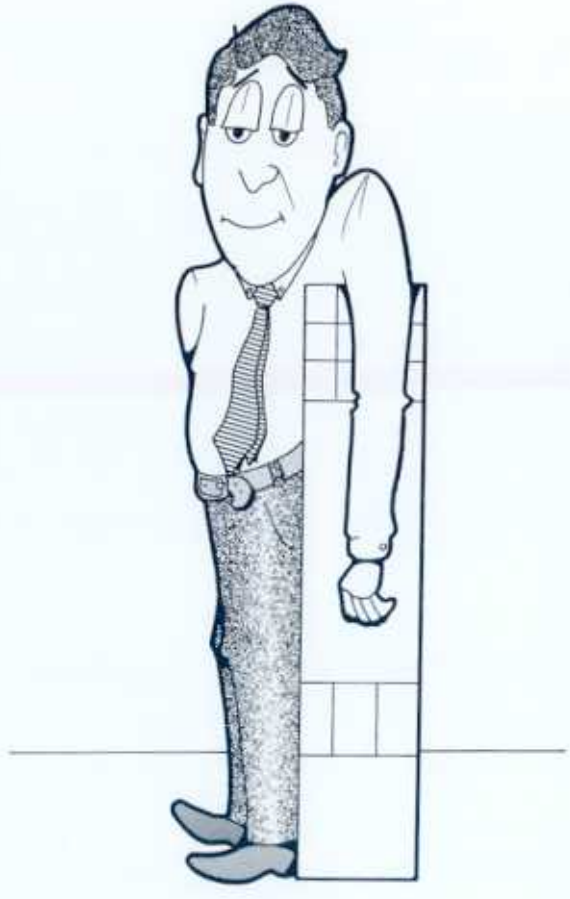


Psychologists call it maintenance rehearsal - a fancy term for repeating things to yourself. It works, but it is limited. When you are busy, you can't depend on it. Use memory joggers like pilot reports.

Why is it that when controllers get busy and they need the memory help the most, they stop writing? Write! Write! and Write!

Use pilot reporting to cue your memory. Use every resource at your command.

Help the pilots help you. If you transmit too much too fast it will overload their memories. This leads to mistakes that you may have to fix.



Some controllers see strips as a crutch. This isn't so. They are very powerful tools to help your memory and planning. Don't be afraid to use all the help you can get.

Do you sometimes feel that you are being pulled in all directions at once ? Actively manage distraction. Do not be complacent, even when the taskload is low. Learn to tune out the irrelevant conversations and other input which could block good information processing.

Never assume that you will remember the clearances you issue. When something interferes with your coding and storage process, you lose details. Take notes and/or mark those strips.

Ask for and accept help that is offered when you need it. There is no place for "John Wayne" in ATC.

No one is so good that they could not benefit from quality recurrent training. If it is offered, take it. If it isn't offered, reach out for it.

Memory of past successes is no guarantee that things will go the way you remember them. Don't assume that what you thought you heard is correct. Memory of past experiences can lead you to misunderstand current input. Follow your notes or strips during the readback!

Don't assume that you can keep shoveling in massive amounts of information without some method and understanding. Working memory is where you think, plan, and solve problems. It is much more limited than your long-term memory. Store and retrieve what you need and let go of the rest.

ACKNOWLEDGMENTS

This guide was developed for, and is dedicated to, the men and women of the Air Traffic Service who keep the skies safe for the flying public. The system could not operate without them. The authors would like to thank all the controllers over the years who took the time to answer our questions and to share their ideas. The Controller Memory Guide is a product of their thinking and experiences. We could not have written it without them.

Many of us take memory for granted. We believe that once we have seen or heard something, it will be there. This is not so. We have to decide what we will need in the future, and then we have to do something about it to make sure it's there when we want it. Good luck!

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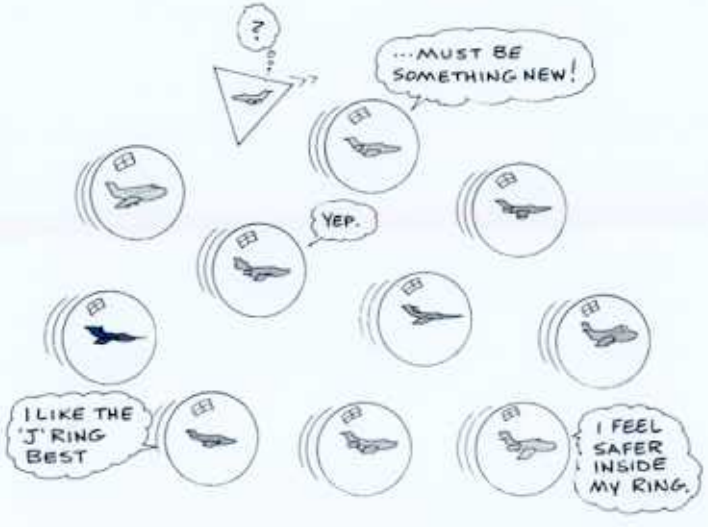

Some of us tend to ignore tools that are already available to us. It makes sense to use what is there if it helps you reduce the possibility for error. The "J" ring is an example.

What are you actively doing to maintain the picture? Memory requires work. Overconfidence can be a serious mistake!

Controller Memory Guide
Reader Response Form

Instructions: Please copy or remove this form from the guide. Fill it out and mail it to the address at the bottom. All responses will be kept confidential.

Fill in the following answers:

Facility _____. Tower/TRACON facility level if applicable: Check One 1 2 3 4 5

Facility type (Circle One): Tower cab, Tracab, TRACON, ARTCC, Tower/TRACON, other _____.

Your role in the facility: (Circle one): FPL, Developmental, SATCS, Staff, other _____.

Below please circle the one number which best summarizes your level of agreement with each of the following statements. Use the entire range of the scale from 1 (Strongly disagree) to 8 (Strongly agree).

The controller memory guide is relevant to what happens in my facility.

Strongly Disagree 1 2 3 4 5 6 7 8 Strongly Agree

The graphics in the guide were appropriate for the concepts presented:

Strongly Disagree 1 2 3 4 5 6 7 8 Strongly Agree

The controller memory guide is a useful job aide:

Strongly Disagree 1 2 3 4 5 6 7 8 Strongly Agree

Below please provide your overall evaluation of the Controller Memory Guide. Circle the number which best describes your evaluation from 1 (Very Poor) to 8 (Very Good).

Very Poor 1 2 3 4 5 6 7 8 Very Good

Below list any concepts that you would like to see covered in a revised future copy of the guide in the future. Also provide any comments that you might have. Use additional sheets if desired.

Mail to: Dr. Earl S. Stein, ACD-350, Building 28, DOT/FAA Technical Center
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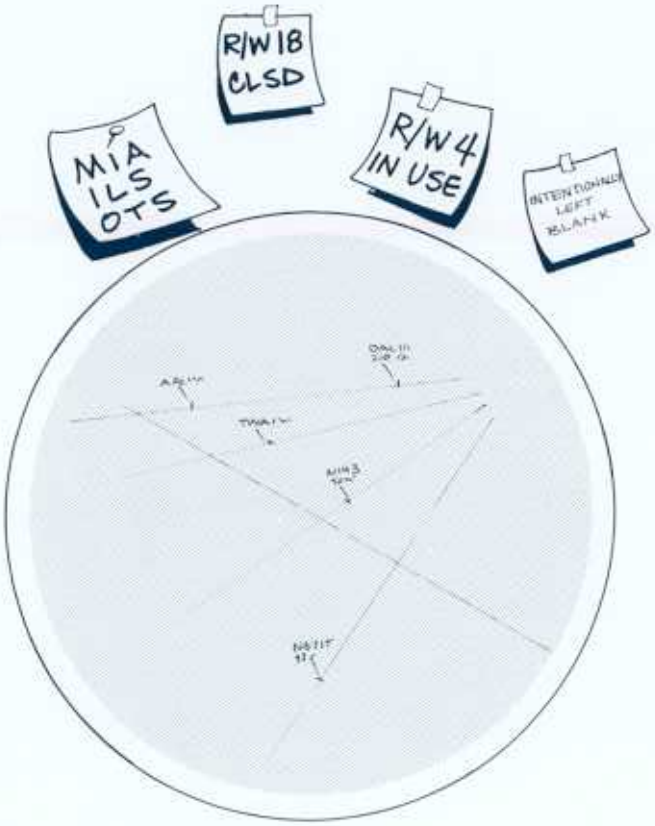
INTRODUCTION

This guide was based on ideas and concepts that controllers have developed for their own use over the years. This material was gathered in surveys and interviews over a 3-year period conducted at towers, TRACONS, and centers. The ideas presented here are a small subset of all that controllers suggested. They were chosen because the authors believed they stood out and could be represented effectively in this training aide. The guide is an attempt to share the wealth of controller's ideas with their brothers and sisters in the work force. Readers are urged to examine the whole guide and take from it whatever they can use to improve the effectiveness of their limited memory resources. The concepts are presented in random order. Some apply to all facilities, and others are very specific. Many of these ideas may seem very basic to the experienced controller. For him or her, they are meant to reinforce what they already know but perhaps have not thought about in the recent past. The reader will quickly see that memory is everywhere. It is involved in almost everything we do!

Low tech memory aides can be a big help. Everything written in plain sight is less that you have to remember.



Keep up the strip marking even when you are busy. The more loaded you are, the easier it is to forget things. Good record keeping can help.