



# "Fit to Fly"

**Presented by:**

**Federal Aviation Administration**

Office of the Chief Scientific & Technical Advisor for Human Factors

Ronald Simmons, *AAR-100*

(202) 267-7058

**Presented at:**





## Fit to Fly

## Meet Freddie T. Frisbee

*"There's a responsibility on the part of the pilot to be  
Fit To Fly!"*

*(USA Today, January 9, 1995)*



**The Goal of the Human Factors Office is to educate you in the human side of flying, and to raise your personal awareness and physical lifestyle standard to best prepare yourself to be *Fit To Fly!***



## Fit to Fly

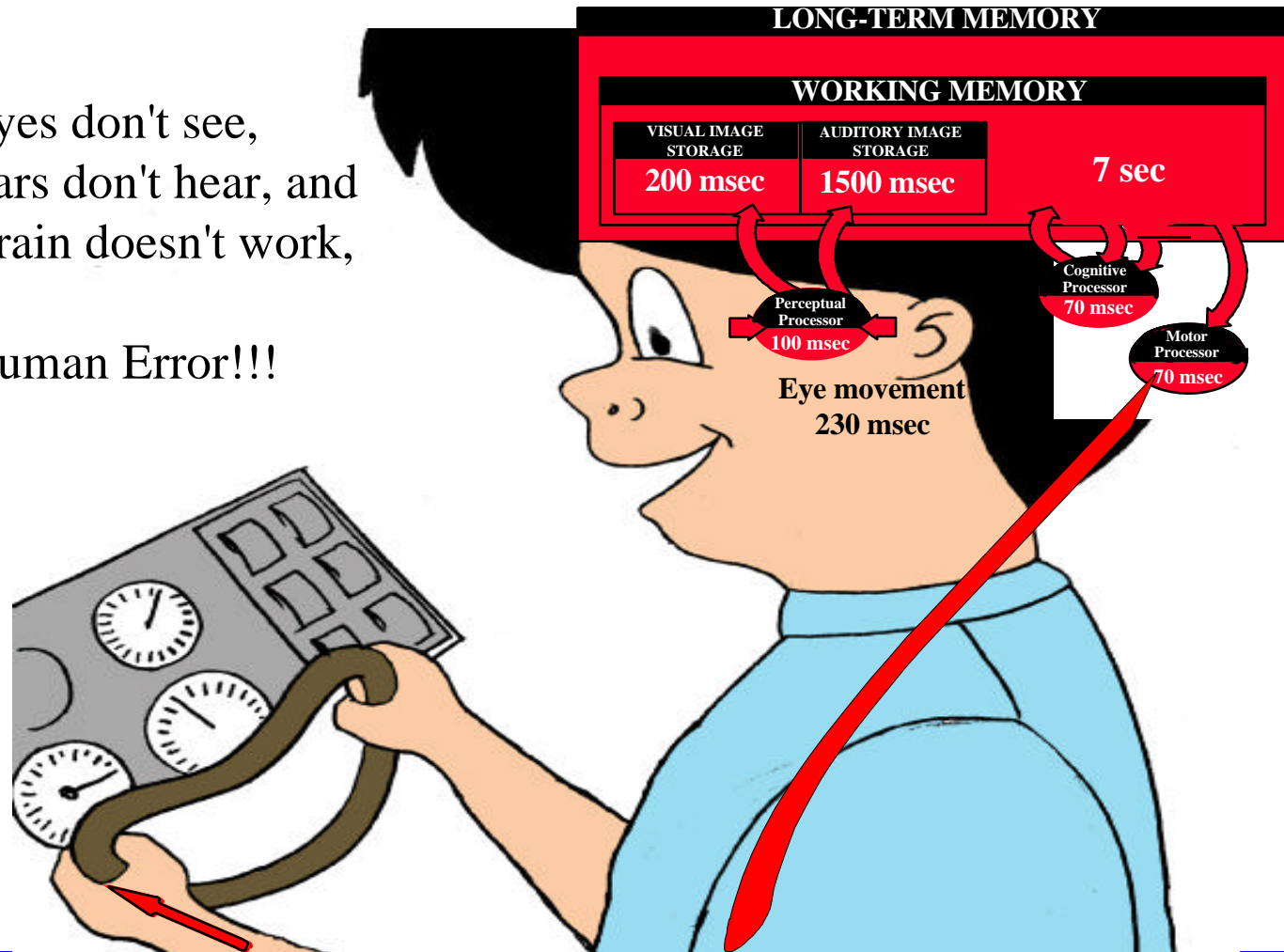
# Human Performance Model

IF.....

Eyes don't see,  
Ears don't hear, and  
Brain doesn't work,

THEN.....

Human Error!!!



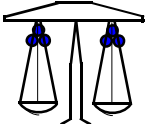


# Fit to Fly

# Human Performance Model

## Maintaining Balance

Human Eng  
Experience  
Proficiency



Stress  
Workload  
Environment

Human Eng  
**Experience**  
Proficiency



Stress  
Workload  
Fatigue

Lack of Experience

By Implementing  
the Proposals  
We Offer -  
You Can Help  
Maintain *Your*  
Balance!

Human Eng  
Experience  
**Proficiency**



Stress  
Workload  
Fatigue

Lack of Proficiency

Human Eng  
Experience  
Proficiency



Stress  
**Workload**  
Fatigue

High Workload

Human Eng  
Experience  
Proficiency



Stress  
Workload  
**Fatigue**

Heavy Fatigue



## Fit to Fly

## Workload

***WORKLOAD*** is a set of task demands with three components:

(1) **Input Loading**

(2) **Operator Effort**

(3) **Work Results**

*(Survey of Methods to Assess Workload )*





## Fit to Fly

## Fatigue

"Fatigue denotes a state represented by a loss in efficiency and a general disinclination to work"

*(Grandjean, 1988)*

*(Human Factors Journal, 1994)*

"Fatigue is now among the top 5 reasons people call the doctor"

*(Newsweek, March 6, 1995)*






# Fit to Fly


# Symptoms / Issues



**"60 - 80 Percent of All Airplane Accidents are Caused by Human Error"**  
*(National Plan for Civil Aviation Human Factors, March 1995)*


$$= \frac{1}{1000}$$

**Actual Percentage  
of Errors**


$$= \frac{1}{10,000,000}$$



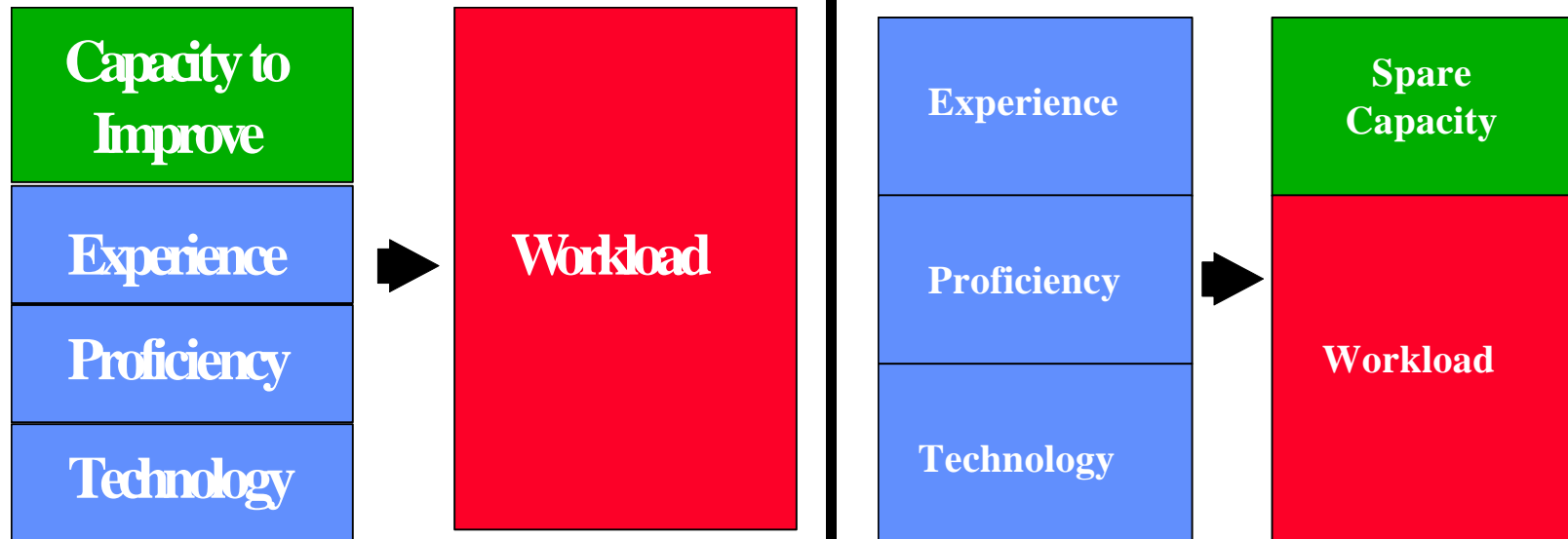
## Symptoms/Issues

## Proficiency/Experience

Lack of experience and proficiency increases workload.

Lack of technology increases workload.

The **spare capacity** in your **workload** is the key to minimizing fatigue.







## Symptoms/Issues

# Turbulence and Vibration

**"Turbulence decreases your visual acuity."**

*(Human Factors in Flight)*



**"2.5 - 3.5 Hz causes a 10% reduction on visual acuity after 90 minutes"**

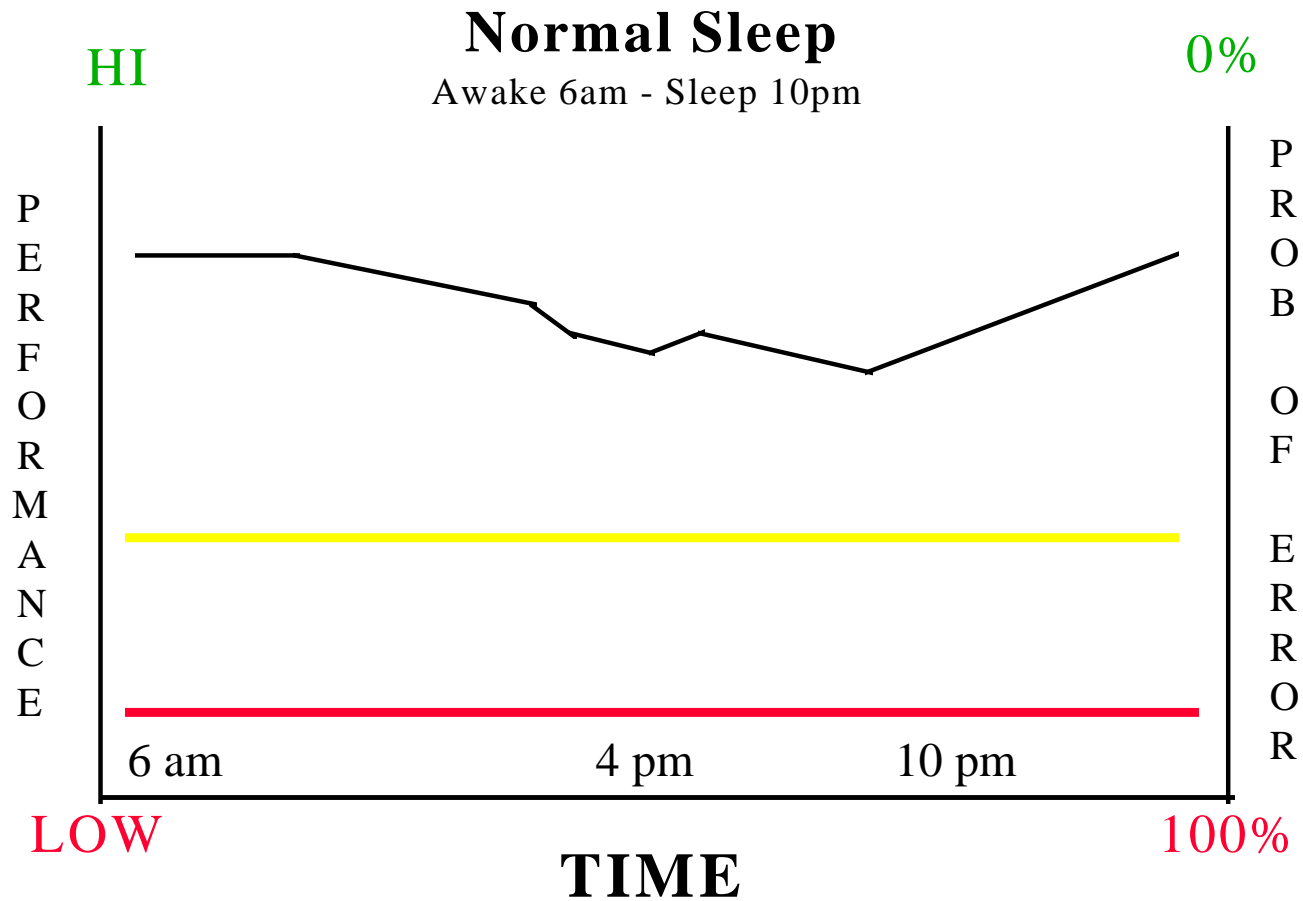
*(Perception and Human Performance)*



# Symptoms/Issues

**"Drowsy Drivers Cause 30% of Fatal Crashes"**

*(Associated Press, December 8, 1994)*



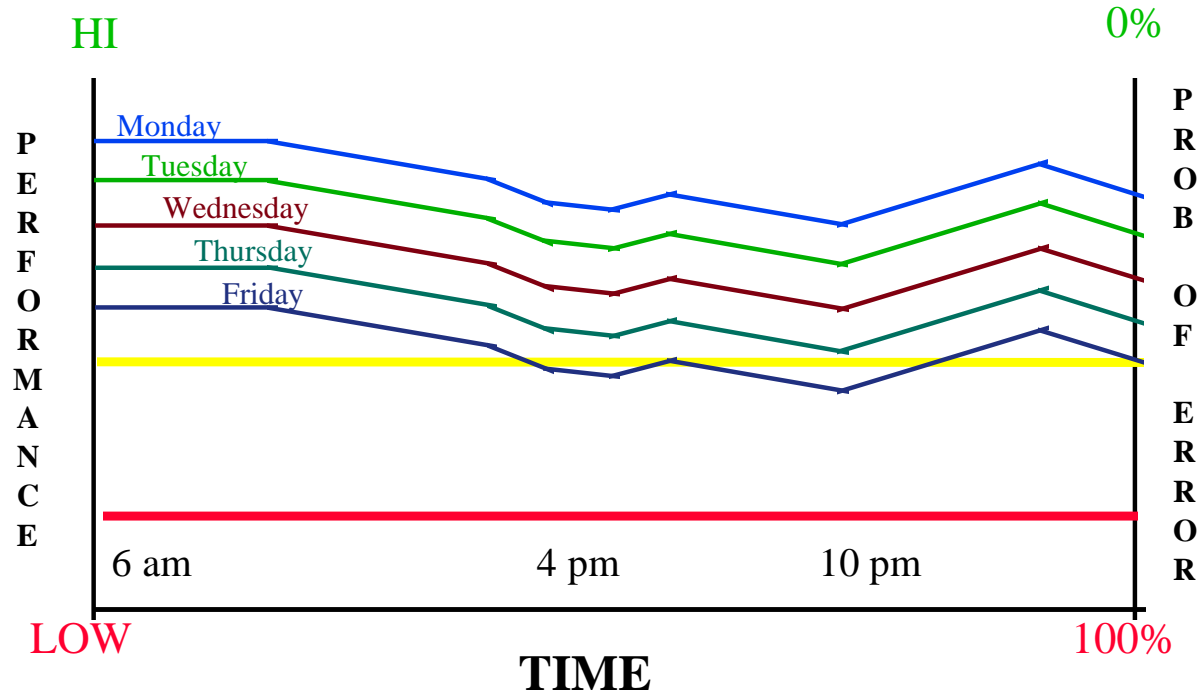


# Symptoms/Issues

**"Over the past century we have reduced our average nightly total sleep time by more than 20%."**  
*(National Commission of Sleep Disorders, 1993)*

## Sleep Debt (6 hours per night)

Normal Sleep = 8 hours (Awake 6am - Sleep 10pm)



**Drowsy Drivers Cause 30% of Fatal Crashes**



## Symptoms/Issues

"You Are What You Eat"

### NUTRITION

#### *Signs of a Poor Diet*

**Fats** ⇨ Sluggish feeling

**Hypoglycemic** ⇨ Low blood sugar

**Sugars** ⇨ Quick high - quicker and deeper low

It takes between 5-15 minutes for the sugar lift

**Post-Lunch Alertness Drop** ⇨ Internal clock/influenced by our own food intake

**Fatigue** (Mind and Muscular) ⇨ Headaches, poor judgement, reduction in memory and recall

**...a study of runway incidents and incursions shown that 20-22% were due in part to the lack of no meals 12-20 hours prior to the incident, and less than 6 hours of sleep...**

*(Pilot Surface Incident Safety Study, March 1993)*



# Symptoms/Issues

**"..above 60dB auditory fatigue results from transfer to neural vibrations - thus mental fatigue.."**

*(Perception and Human Performance)*

## Noise

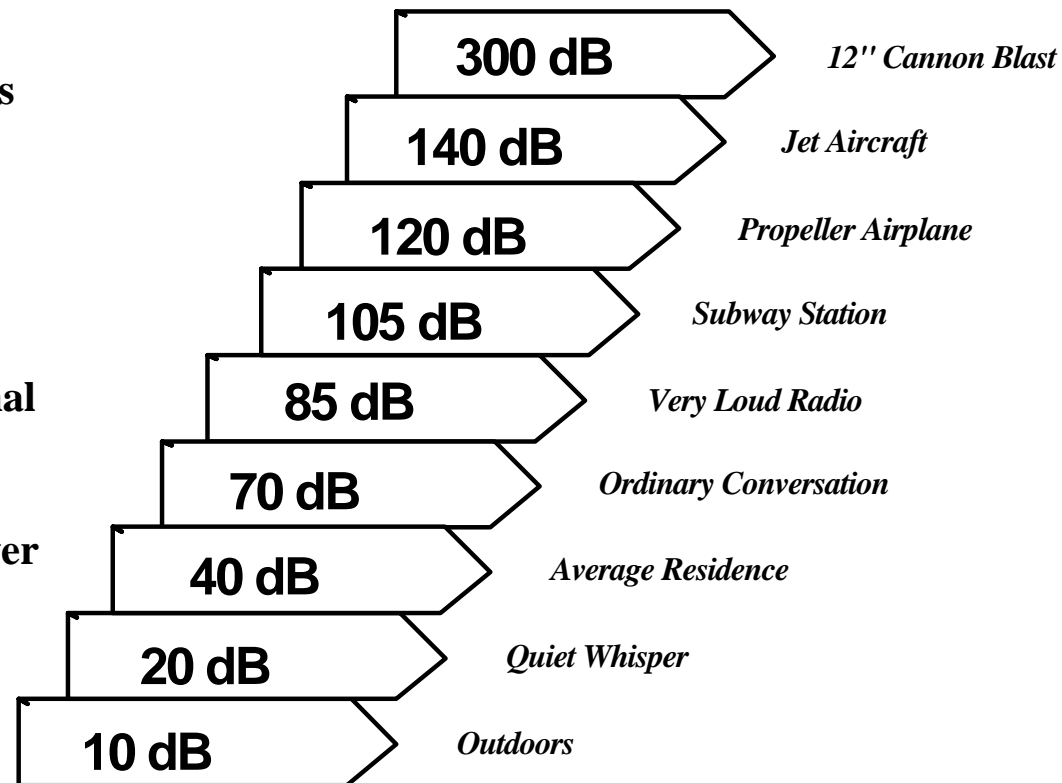
**100 dB**

**Causes increased errors within 10 minutes**

**Reduces short term memory effectiveness**

**Conflicts with situational awareness**

**Increases in severity over time - exposure over 30 minutes**



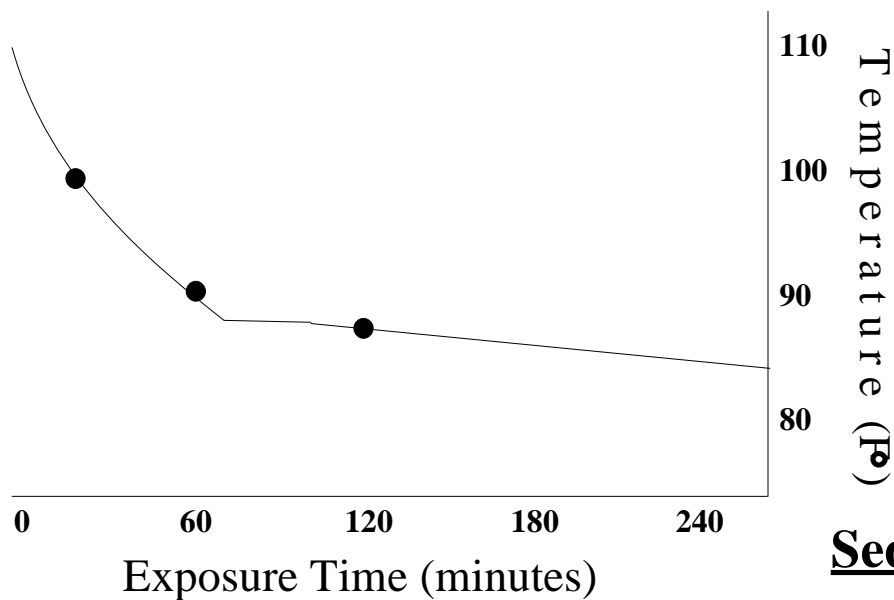


## Symptoms/Issues

**"Cockpits have been measured  
in excess of 120 F"**

*(Human Factors in Flight)*

### TEMPERATURE

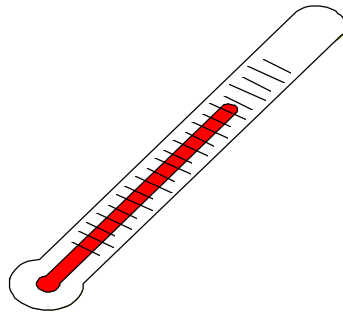


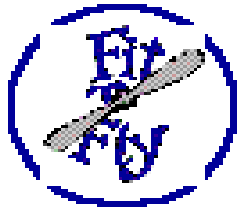
#### Mental and Reaction Time:

Visual Search  
Mental Math  
Coding  
Vigilance  
Situational Attention

#### Sedentary Performance Can Occur

- \* after 120 minutes @ 86 deg. F
- \* after 60 minutes @ 90 deg F.
- \* after 25 minutes @ 100 deg. F

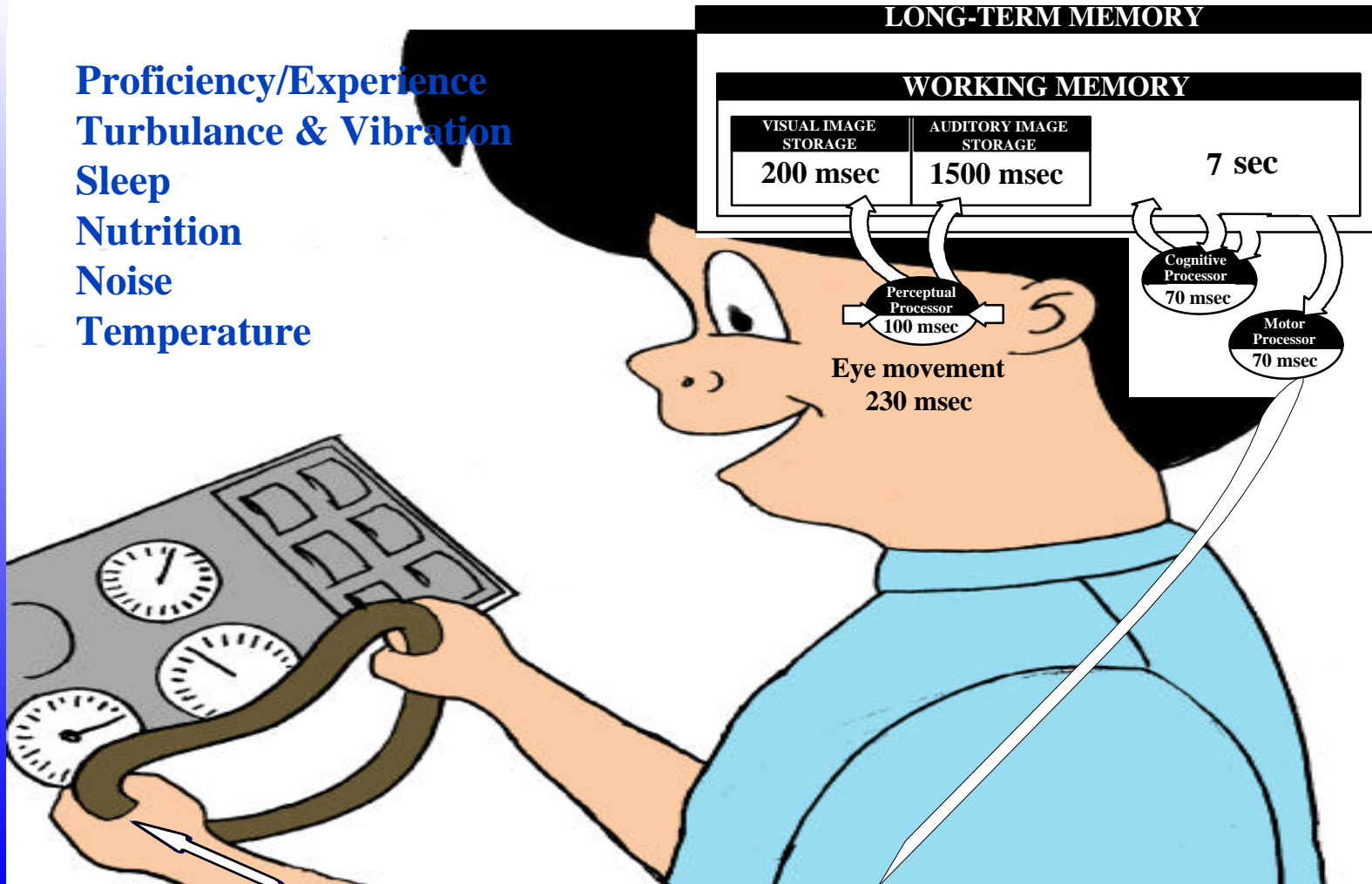




## Symptoms/Issues

# Human Performance Model

Proficiency/Experience  
Turbulence & Vibration  
Sleep  
Nutrition  
Noise  
Temperature





# Human Factors Proposals

**Be Fit to Fly!**







# Human Factors Proposals

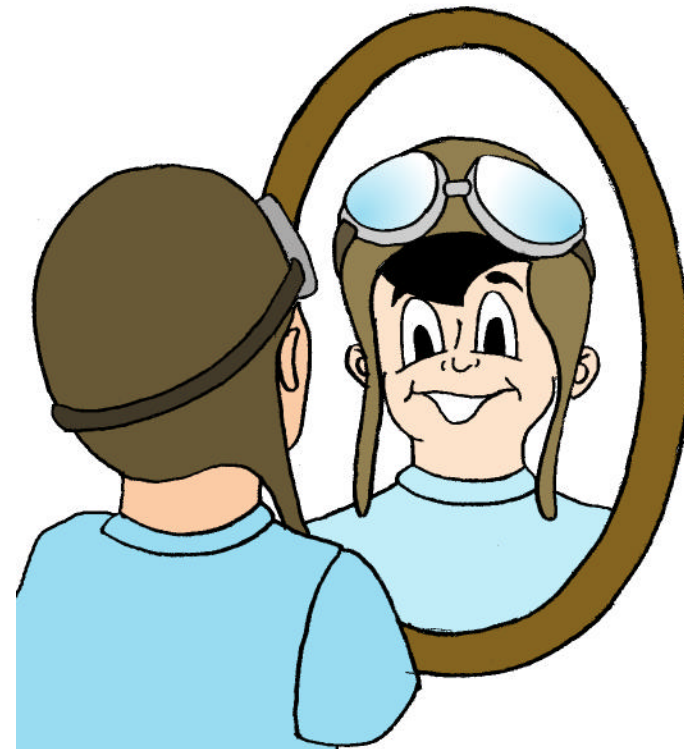
## Self-Assessment

### What and Why?

- Create an awareness of your actions
- Assess within yourself, actualize your behavior rather than rationalizing it
- Reflect on results of your behaviors
- Know your own limitations

### When to Assess?

- Pre-Flight
- Mid-Flight
- Partner monitoring continually during flight
- Post-Flight

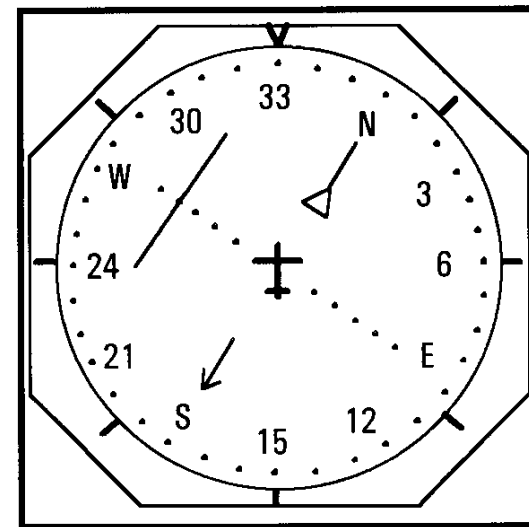
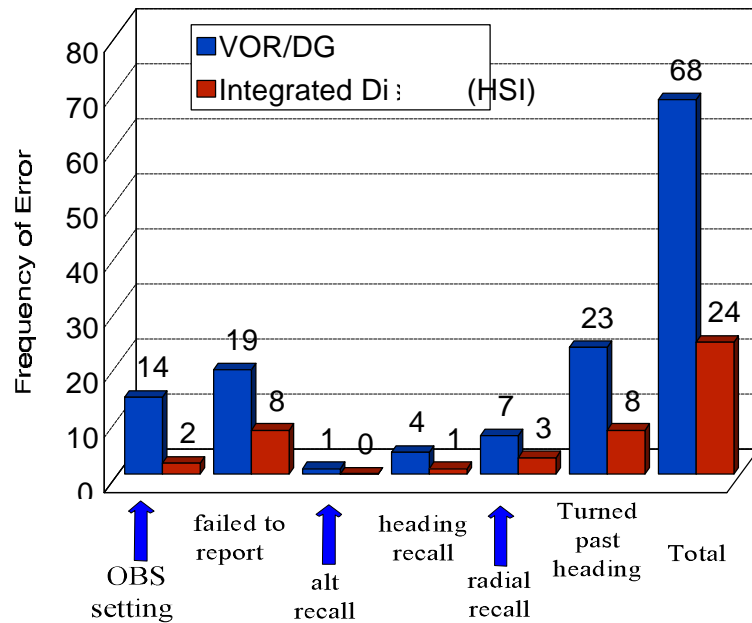






# Human Factors Proposals

# Workload



- **Error Category (12 private pilots)**

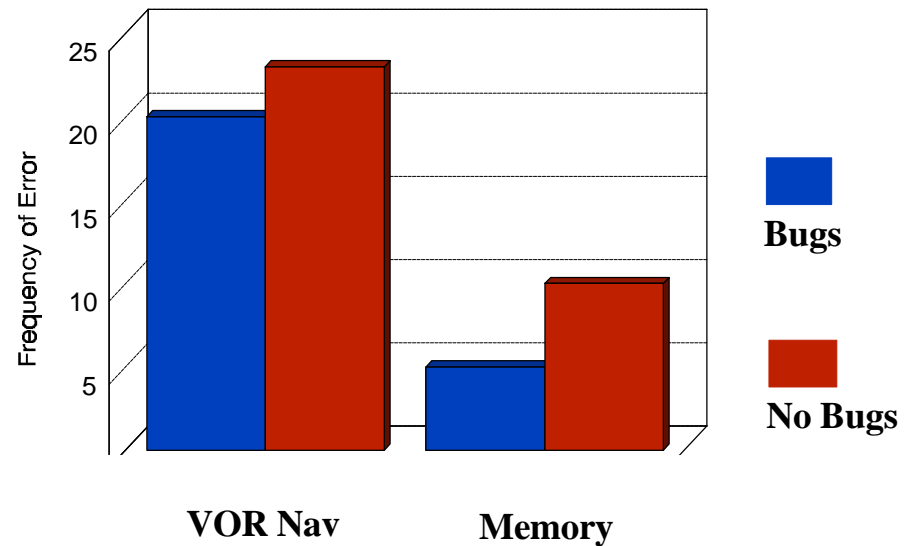
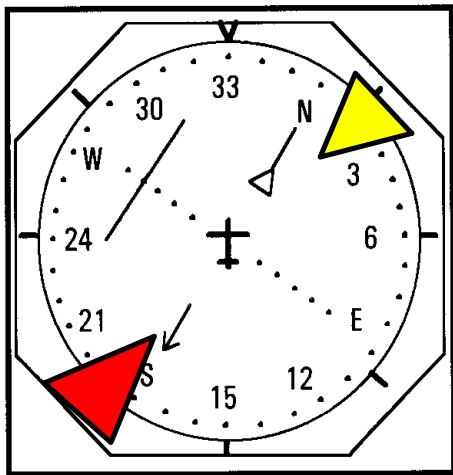
- **Auto Pilot**



# Human Factors Proposals

## Turbulence and Vibration

- Proficiency/Experience
- Instrument Bug Settings
- More Stops
- Auto Pilot





# Human Factors Proposals

## Sleep

**"Alert pilot's best air-safety device; give them time to rest!"**

*(USA Today, Jan 17, 1995)*

- **More Sleep**
- **Power Naps**
- **Caffeine Usage**
- **Seat Position**





# Human Factors Proposals

## Nutrition

**Create a Self-Help Check List -  
*"Learn To Listen to Your Body"***

**Recognize Yourself** - Normal Biological Symptoms

**Modify Your Habits** -Timing of Food Intake, Amount, Content, Fluids

**Plan Your Day!**



# Human Factors Proposals

It takes 1 1/2 hours for the body to get carbohydrates into a usable form - then it lasts for about 3 hours.

**BREAKFAST:** A critical meal - it improves memory and cognitive abilities. It provides long lasting energy. Eat before take-off.

*Examples:* Dry cereal with skim milk, bananas. Bagel/toast with jelly.  
Fruit juice.

**LUNCH:** Combine carbohydrates and proteins to improve alertness and ability to think under pressure.

*Examples:* Tuna sandwich, peanut butter and jelly, apple, orange.

**DINNER:** A well balanced dinner will make you feel stronger, more proficient and improve reasoning.

*Examples:* One serving each of: Low fat fish and meat. Rice, potatoes, beans, and pasta. Vegetables, steamed and fresh. Bread and fruit.

**TIP:** Bring snacks such as dried fruit for mid-morning/afternoon snacks. Bring plenty of water, remember to drink before you are thirsty.



# Human Factors Proposals

## Temperature

### Maintain Proper Hydration

- **Minimum amount of water necessary in a certain amount of time**
- **Plan to carry the needed amount of water with you**
- **Plan consumption of beverages to coincide with your rest stops**
- **Gatorade research**
- **Types of beverages/effects**



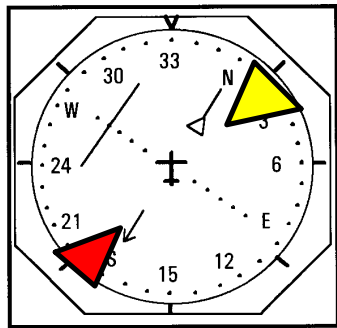




# Human Factors Proposals

## Memory Aids

### Instrument Bugs



### Aircraft Checklist

- Pre-Flight.....
- Level-Off.....
- Approach....
- Landing.....

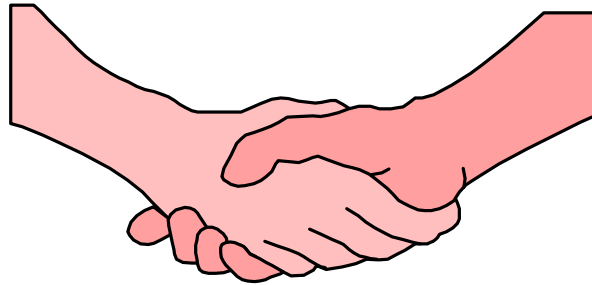
### Fit to Fly Checklist

- Sleep
- Noise
- Temperature
- Nutrition
- Proficiency/  
Experience
- Turbulence  
& Vibration



# Human Factors Proposals

## Partner Monitoring



### **Pilot's Role**

*The pilot should encourage the passenger to monitor him or her, and then commit to reacting responsibly to the passenger's suggestions.*

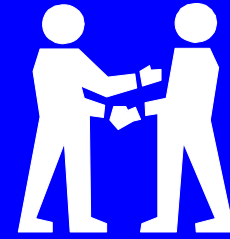
### **Passenger's Role**

*The passenger should accept responsibility for monitoring the pilot and must be willing to suggest alternative measures as needed.*



# Human Factors Proposals

## Partner Monitoring



### Tools for Monitoring Partners

<b>Condition</b>	<b>Reaction</b>	<b>Observations</b>
<b>Not Drowsy</b>	Observe	Normal facial tone, normal fast eye blinks, short ordinary glances, occasional body movements
<b>Slightly Drowsy</b>	Mention to Pilot	Decreased facial tone, rubbing eyes or face, scratching, facial contortions, moving restlessly in the seat
<b><i>Moderately Drowsy</i></b>	<i>Concern and Request for Reaction</i>	Subdued appearance, slower eyelid closures, glassy-eyed appearance, staring at a fixed position
<b><i>Very Drowsy</i></b>	<i>Take-Over Flight</i>	2-3 second eyelid closure, rolling eyes, cross-eyed look, decreased facial tone, lack of apparent activity; large isolated movements, reorienting the head from a leaning or tilting position
<b><i>Extremely Drowsy</i></b>	<i>If No Previous Reactions to Observations - JUMP!</i>	Falling asleep, 4 second or longer eyelid closures, prolonged periods of lack of activity; large movements as transition in and out of intervals of dozing



## Fit to Fly

**What can you do for yourself?**

**Make the decision today! Take as many of the proposals as possible, and make them a part of your everyday life. As pilots, remember that YOU have the responsibility to be**

*Fit To Fly!*





## **Fit To Fly**

**For Information  
Please Contact**

**Ronald Simmons, AAR-100  
Federal Aviation Administration  
800 Independence Ave., SW  
Washington, DC 20591  
(202) 267-7058  
Internet: <http://www.hf.faa.gov/>**

