

# Station Ergonomic Design

*Improve your scores by  
increasing your comfort  
and reducing fatigue*

**Doug Grant, K1DG**  
(with inputs from Jack Russell K2RS)



## ***What is ergonomics?***

- ▶ *Ergonomics is adapting the physical requirements of the job to suit your needs, especially your comfort.*
  
- ▶ *For contesting:*
  - ▶ *making your station more comfortable*
  - ▶ *less tiring as you spend long hours in the chair*

# Comfort



- ▶ In contesting “chair time” is essential to success
  - ▶ More comfort → More time in chair
- ▶ The longer you can stay seated comfortably at the rig working stations, the more points you’ll make
  - ▶ More hours → More QSOs
- ▶ When you think about making changes to your operating position, comfort should be a first priority



# How do you optimize a task involving man & machine?



- ▶ ***“The Principles of Scientific Management”***  
Frederick Winslow Taylor, 1911
  - ▶ Replace work methods with methods based on a scientific study of the tasks
- ▶ Taylor’s Shovels
  - ▶ Determined the optimum load for shoveling: 9.75kg
  - ▶ Designed different-size shovels for different materials



# Mr. & Mrs. Frank and Lillian Gilbreth

## Motion Studies



17 “therbligs” (motion units) plus Rest to overcome fatigue

- ▶ Search
- ▶ Find
- ▶ Select
- ▶ Grasp
- ▶ Use
- ▶ Pre-position for next operation
- ▶ Unavoidable delay
- ▶ Avoidable delay
- ▶ Plan
- ▶ Hold
- ▶ Position
- ▶ Assemble
- ▶ Disassemble
- ▶ Inspect
- ▶ Transport loaded
- ▶ Transport unloaded
- ▶ Release load



# How does this relate to Contest Station Design?



- ▶ Making QSOs faster means wasting less time:
  - ▶ Searching for the VFO/AF Gain... knob, Finding the knob
  - ▶ Selecting the antenna, Grasping the CW paddle
  - ▶ Using the keyboard, Pre-position the RIT for next operation
  - ▶ Unavoidable delay waiting for a station to send his callsign
  - ▶ Avoidable delay reaching for the antenna switch
  - ▶ Planning to call someone split



# Fatigue



- ▶ Being uncomfortable for long periods of time leads to fatigue
- ▶ In a contest, fatigue will reduce your QSO rate and increase your errors
- ▶ Errors in copying or logging reduce your score!
- ▶ A well-designed, ergonomic operating position should minimize fatigue



## Chair, desk and equipment layout

- ▶ These are the three main areas where you can customize your operating position to suit your personal requirements.
- ▶ Included with equipment is:
  - ▶ Keyboard, mouse and monitor
  - ▶ Keyer paddle, mic/headphones
  - ▶ Rig, amplifier
  - ▶ Tuners, antenna switches
  - ▶ Other controls/accessories



## Features to look for in a chair

- ▶ Adjustable height:
  - ▶ 90-degree bend in your knees,
  - ▶ 90-degree bend in your hips,
  - ▶ When seated with your feet flat on the floor
- ▶ Adjustable or removable arm rests
  - ▶ Should fit under the desk
- ▶ Comfortable seat cushion
  - ▶ support extending to the back of the knees
- ▶ Lumbar support



## Lumbar (lower-back) support

- ▶ Important for long-term comfort
- ▶ Ergonomically-designed chairs fit the curve of your back
- ▶ You can add lumbar support to your existing chair
- ▶ Lumbar-support cushions are available
- ▶ A rolled up towel or small blanket can also be used

## Bring your own

- ▶ Some multi-op stations do not have enough “good” chairs.
- ▶ Bring your own chair, especially if you have one that’s comfortable for long sessions at the rig

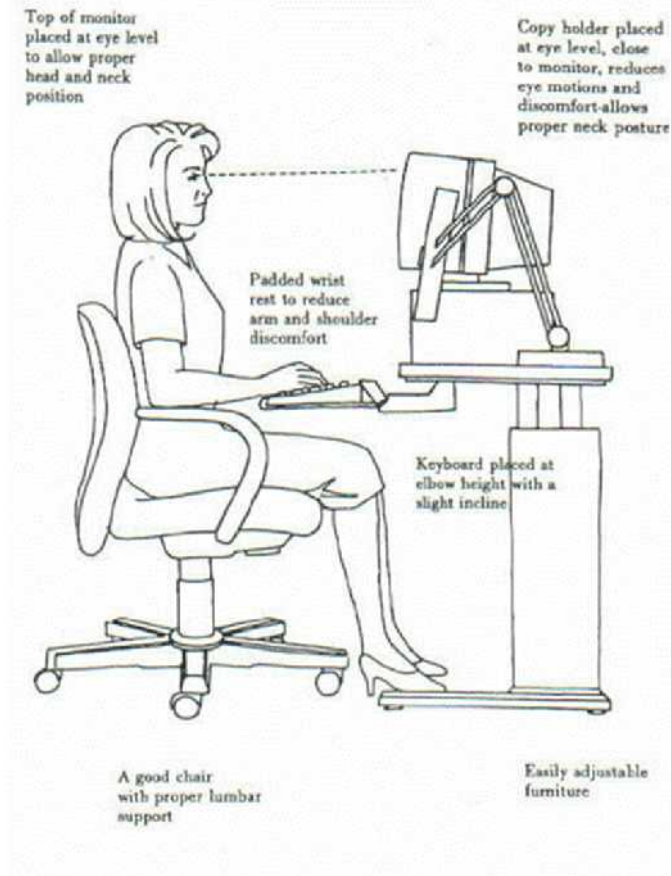


## The desk

- ▶ Nobody manufactures a desk for radio contesting!
- ▶ Most desk tops are too high for comfortable use of a computer keyboard
- ▶ When seated, your arms should have a 90-degree bend at the elbows (that “90-degree rule” again) as your hands reach to the keyboard

# Desk height vs. operator height

WORKING IN NEUTRAL



## Op Height

## Table Height

154 -160 cm

63.5 – 66 cm

162 -168 cm

66 - 68.5 cm

170 -183 cm

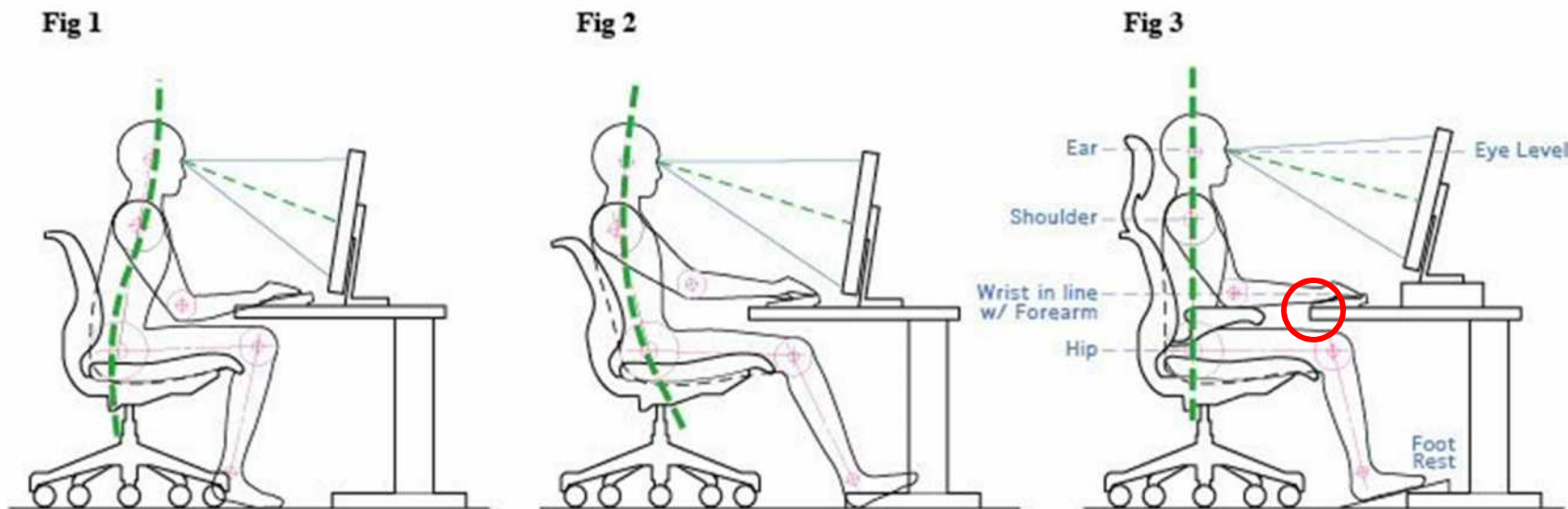
68.5 - 72 cm

185 -195 cm

72 - 81 cm



# Getting comfortable



- ▶ Figure 3 shows the correct – most comfortable – position
- ▶ Avoid sharp edges on the desk if possible

# Monitor placement

- ▶ The computer monitor should be directly in front of you at eye level
  - ▶ You don't have to look up, down or to the side to see it
- ▶ Should be the correct distance from your eyes so you can see without squinting or leaning forward
- ▶ If you wear bifocal eyeglasses, consider buying a pair of mid-distance “computer glasses”
- ▶ Flat-screen LCD gives room on the desktop for other things





# Too Many Monitors!!!!



**Contest station or NASA????**



## View from the top

- ▶ Keyboard and mouse within easy reach and monitor straight ahead



- ▶ Use this area for power supplies, tuners, things not used often

## Where does the rig go?

- ▶ Where it can be seen easily
- ▶ Controls can be accessed without reaching, turning or twisting
- ▶ For most single op stations, placing the rig below the monitor is a good choice
- ▶ SO2R stations may want to place radios side-by-side below the monitor





# Tuning the amplifier quickly

- ▶ Option 1: Autotune amplifier
  - ▶ +: All tuning automatic + fast
  - ▶ -: High Price
  
- ▶ Option 2: Normal amp with labels
  - ▶ +: Lowest cost
  - ▶ -: Must remember which band when tired
  
- ▶ Option 3: Separate amplifier for each band
  - ▶ +: No tuning needed
  - ▶ -: VERY high cost

# Two Examples of Labeling Amplifier Tuning



UNIVERSIDADE FEDERAL DO BRASIL  
Federal University





## Stay awake and alert

- ▶ Stand up and move around at least once every hour
- ▶ Sitting for long periods of time can make you uncomfortable, stiff, cause cramping
- ▶ Can cause more serious health problems like DVT (Deep Vein Thrombosis – blood clots)
- ▶ Do simple stretching to stay loose and keep blood flowing
- ▶ Wear loose, comfortable clothes

# Computer & Desk Stretches

Approximately 4 Minutes

Sitting at a computer for long periods often causes neck and shoulder stiffness and occasionally lower back pain. Do these stretches every hour or so throughout the day, or whenever you feel stiff. Photocopy this and keep it in a drawer. Also, be sure to get up and walk around the office whenever you think of it. You'll feel better!



1  
10-20 seconds  
2 times



2  
10-15 seconds



3  
8-10 seconds  
each side



4  
15-20 seconds



5  
3-5 seconds  
3 times



6  
10-12 seconds  
each arm



7  
10 seconds



8  
10 seconds



9  
8-10 seconds  
each side



10  
8-10 seconds  
each side



11  
10-15 seconds  
2 times



12  
Shake out hands  
8-10 seconds



**CTU BRASIL**  
Contest University



## Food and Drink

- ▶ Light snacks only
  - ▶ Too much input --> too much “output” --> too much time off
  - ▶ Not too much sugar
- ▶ No alcohol (especially no caipirinhas!!!)
  - ▶ Water is best...maybe “Gatorade”-type drinks
  - ▶ Coffee, Red Bull, etc. in moderation for single-ops
- ▶ Keep in shack to minimize time off (and temptation)
- ▶ Multiops: have good coffee!!!



## In Station Design, Comfort is your Goal

- ▶ Ergonomic improvements to your operating position should make it more comfortable for contesting
- ▶ If you can reduce fatigue and increase your comfort, you'll make more QSOs
- ▶ Start with a few changes and add others as you think they're needed
- ▶ Test your layout...how long to change bands?
- ▶ Can you change bands with your eyes closed?



# Comfort is your goal



**USA 5 – BRA 3**

# Sleeping

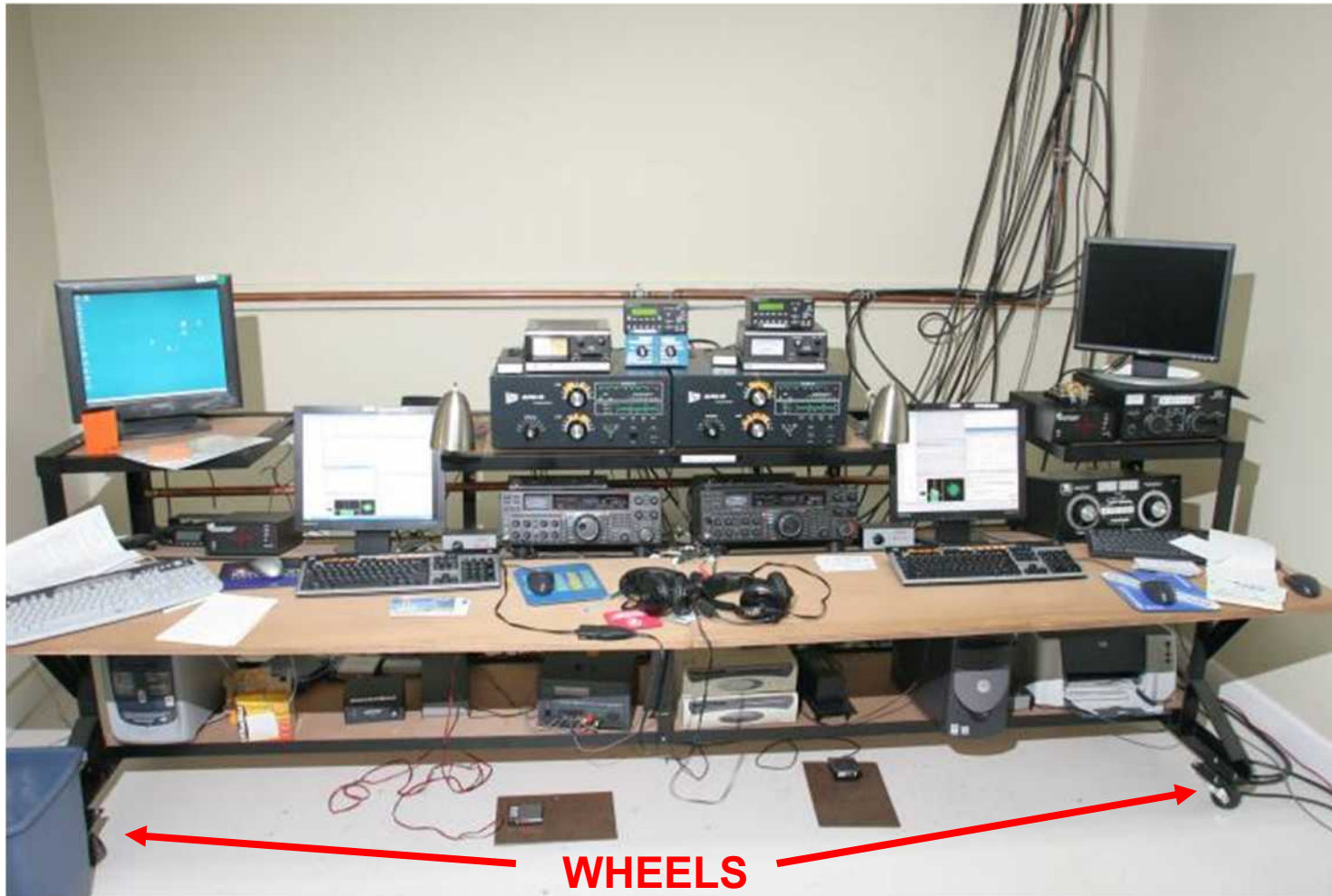
- ▶ Take breaks when the rate is lowest
- ▶ Set two alarm clocks to wake you up
- ▶ Place one very loud alarm across the room so you have to get up to turn it off!
- ▶ **DO NOT GO BACK TO SLEEP “FOR A FEW MORE MINUTES”!!! MINUTES TURN INTO HOURS!!**



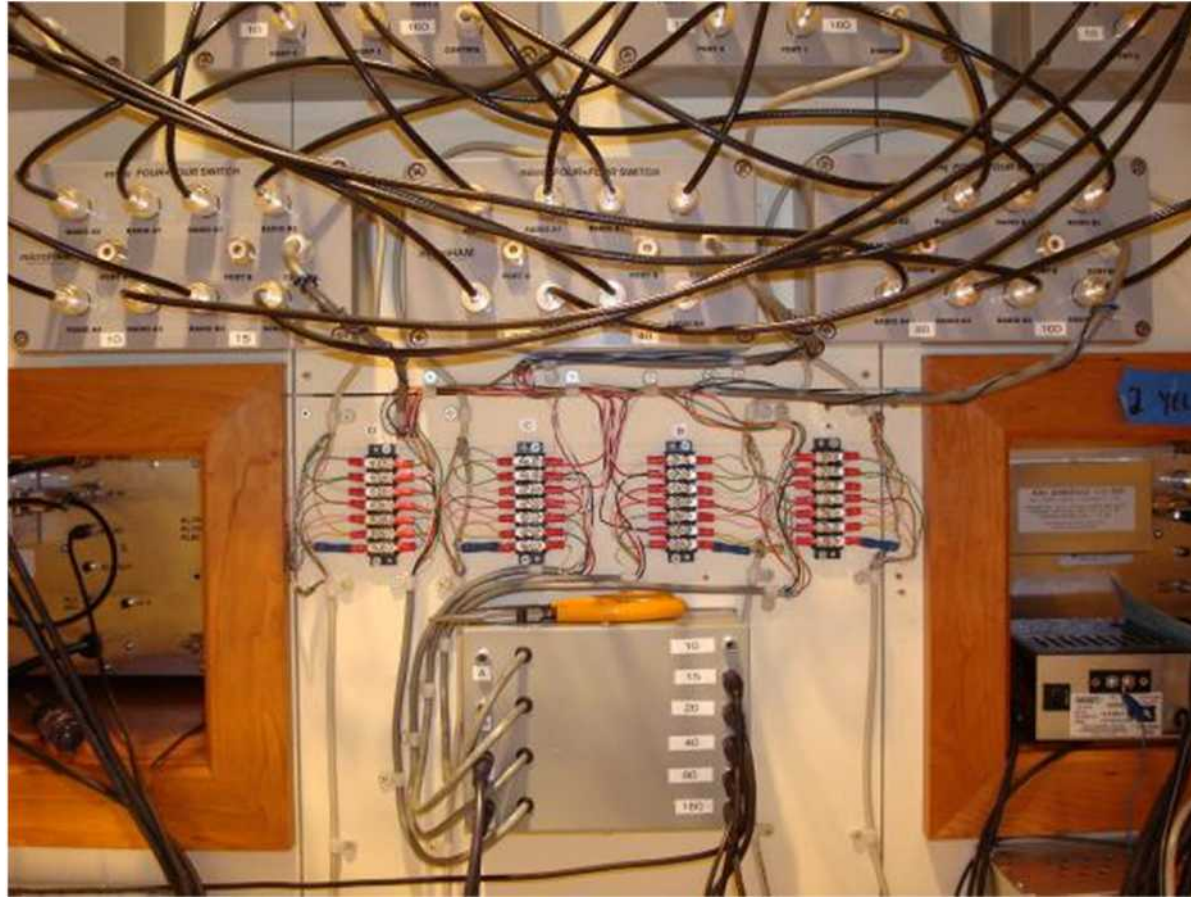
## Keep wiring neat and accessible

- ▶ When things break, you must be able to fix them quickly
- ▶ Long repair time = less QSO time!
- ▶ If things are neat and organized, they can be located and repaired

# WW4LL Station on Wheels



# Which station would you rather fix? This one...





## Or this one?

Neat wiring won't  
make you louder.

It does make things  
easier to fix when  
things go wrong

And when things go  
wrong, you aren't  
loud at all





# Additional Ergonomic Considerations



- ▶ Heating/cooling
  - ▶ Continuous CQing generates a lot of heat
  - ▶ Even in W1, need cooling in winter contests
  - ▶ Basement shacks: keep feet off the floor!
- ▶ Acoustic Noise
  - ▶ Close the door
  - ▶ Isolate the heat, ventilation, air conditioning noise from the shack
  - ▶ Consider noise-cancelling headphones



## For Multiops

- ▶ Your 2-10 weekend
- ▶ guests need:
  - ▶ Food
  - ▶ Coffee
  - ▶ A quiet place to sleep
  - ▶ A place to shower
  - ▶ Parking spaces
- ▶ A nice meal after the contest is over



K3LR Flavia® Coffee Station

# Quiz: How many mistakes can you find in this station?





# Antennas and QTH are OK!!! (VY2ZM)





***Obrigado!***

