Wiring Practices

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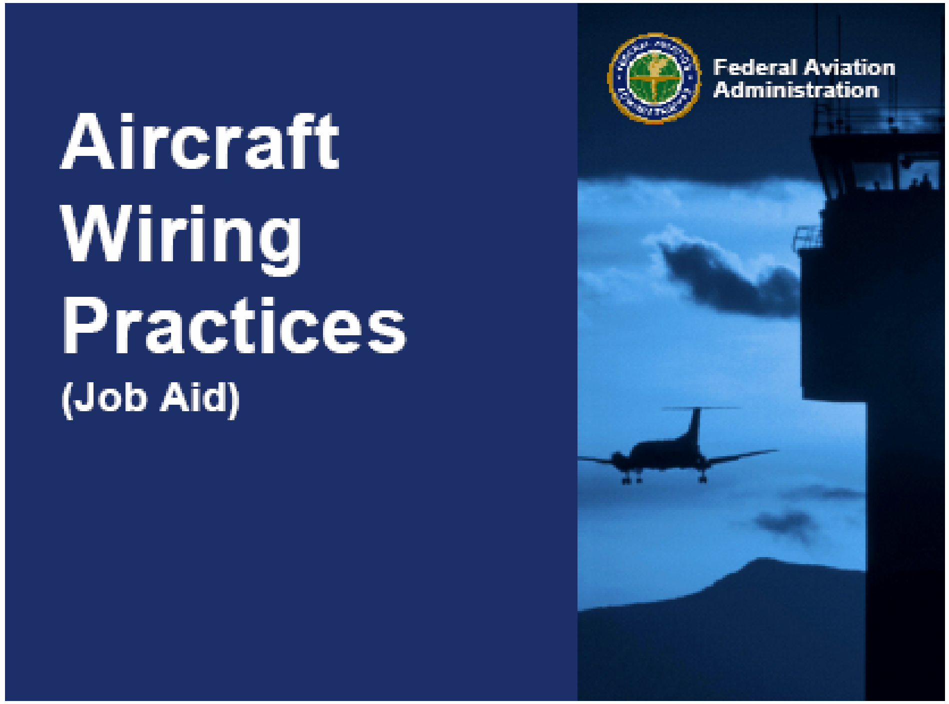
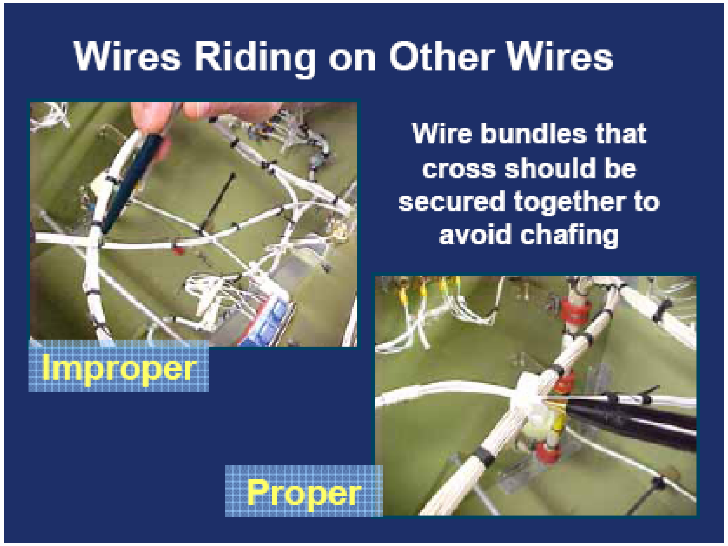
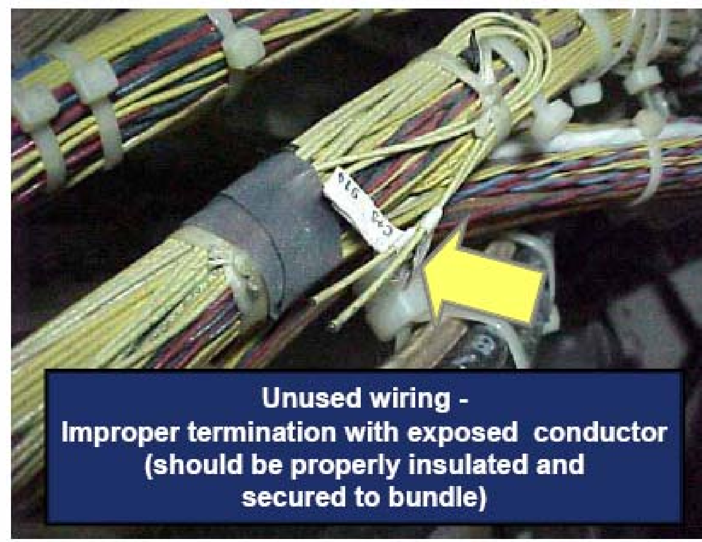
Aircraft Wiring Practices



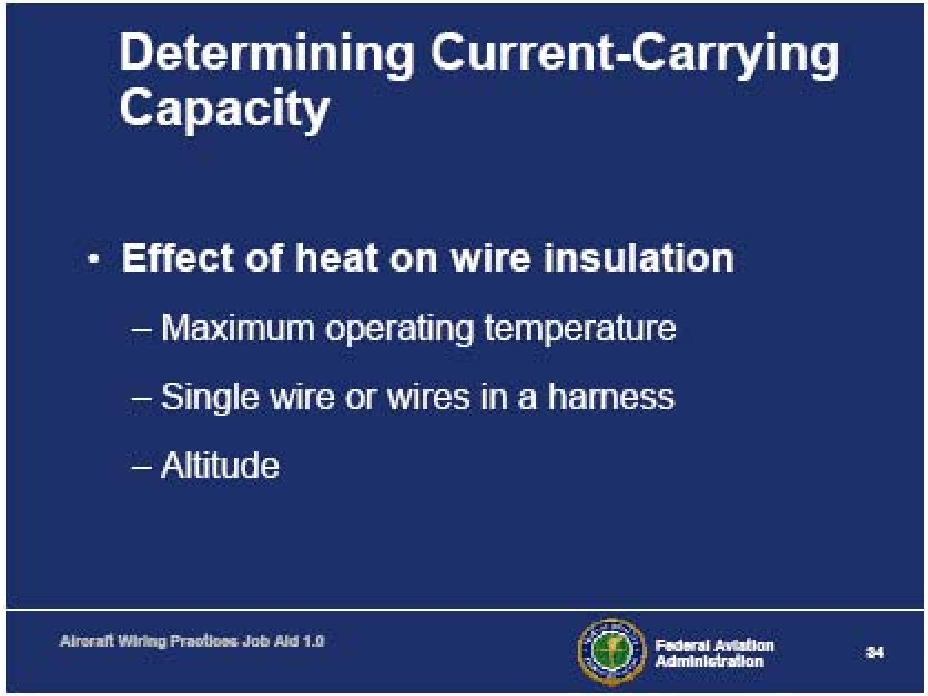
This job aid covers applicable 14CFRs, policy, industry wiring practices; primary factors associated with wire degradation; information on TC/STC data package requirements; wire selection and protection; routing, splicing and termination practices; wiring maintenance concepts, including how to perform a wiring general visual inspection. The job aid also includes numerous actual aircraft wiring photos and examples.

Bundles in Aircrafts



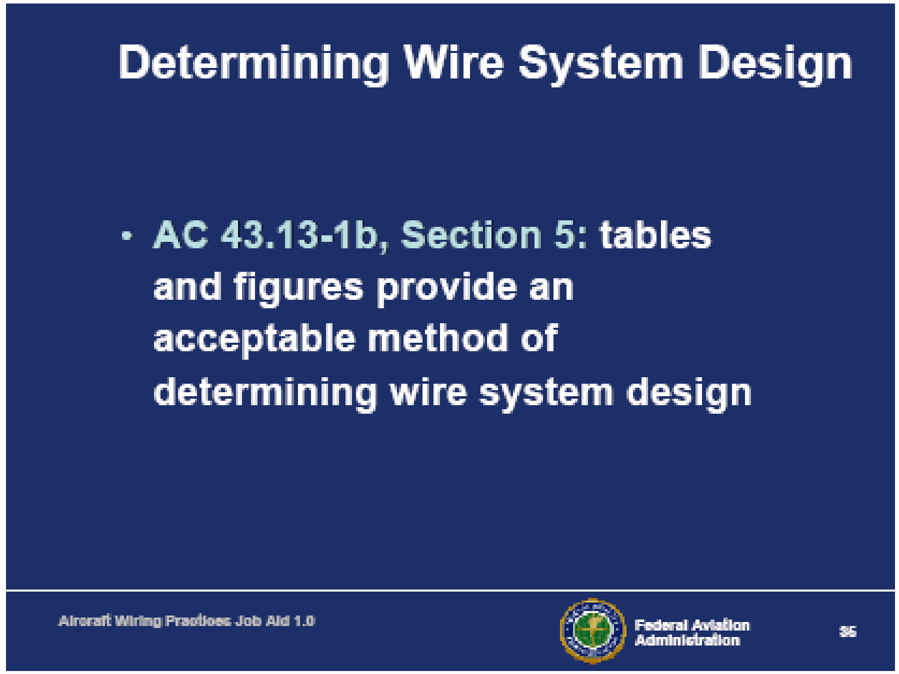


Determining Current-Carrying Capacity



Heating is an important factor affecting wire insulation. This must be factored into proper selection of wire for each particular application.

AC 43.13-1b, Section 5



AC 43.13-1b, Section 5

SECTION 5. ELECTRICAL WIRE RATING

11-67. METHODS FOR DETERMINING CURRENT CARRYING CAPACITY OF WIRES. This paragraph contains methods for determining the current carrying capacity of electrical wire, both as a single wire in free air and when bundled into a harness. It presents derating factors for altitude correction and examples showing how to use the graphical and tabular data provided for this purpose. In some instances, the wire may be capable of carrying more current than is recommended for the contacts of the related connector. In this instance, it is the contact rating that dictates the maximum current to be carried by a wire. Wires of larger gauge may need to be used to fit within the crimp range of connector contacts that are adequately rated for the current being carried. Figure 11-5 gives a family of curves whereby the bundle derating factor may be obtained.

AC 43.13-1b, Section 5

STEP 1: Assuming that the recommended load bank testing described in paragraph 11-66d(5) is unable to be conducted, then the estimated calculation methods outlined in paragraph 11-66d(6) may be used to determine the estimated maximum current (Imax). The #14 gauge wire mentioned above can carry the required current at 50 °C ambient (allowing for altitude and bundle derating).

(6) Use figure 11-4a to calculate the Imax a #14 gauge wire can carry.

(7) Find the temperature differences (Tr-Ta) = (200° C-50° C) = 150 °C.

(8) Follow the 150° C line to intersect with #14 wire size and reads 47 Amps at bottom of chart (current amperes).

(9) Use figure 11-6, left side of chart reads 0.91 for 20,000 feet, multiple 0.91 x 47 Amps = 42.77 Amps.

(10) Use figure 11-5, find the derate factor for 8 wires in a bundle at 60 percent. First find the number of wires in the bundle (8) at bottom of graph and intersect with the 60 percent curve meet. Read derating factor, (left side of graph) which is 0.6. Multiply 0.6 x 42.77 Amps = 26 Amps.

T_2 = estimated conductor temperature

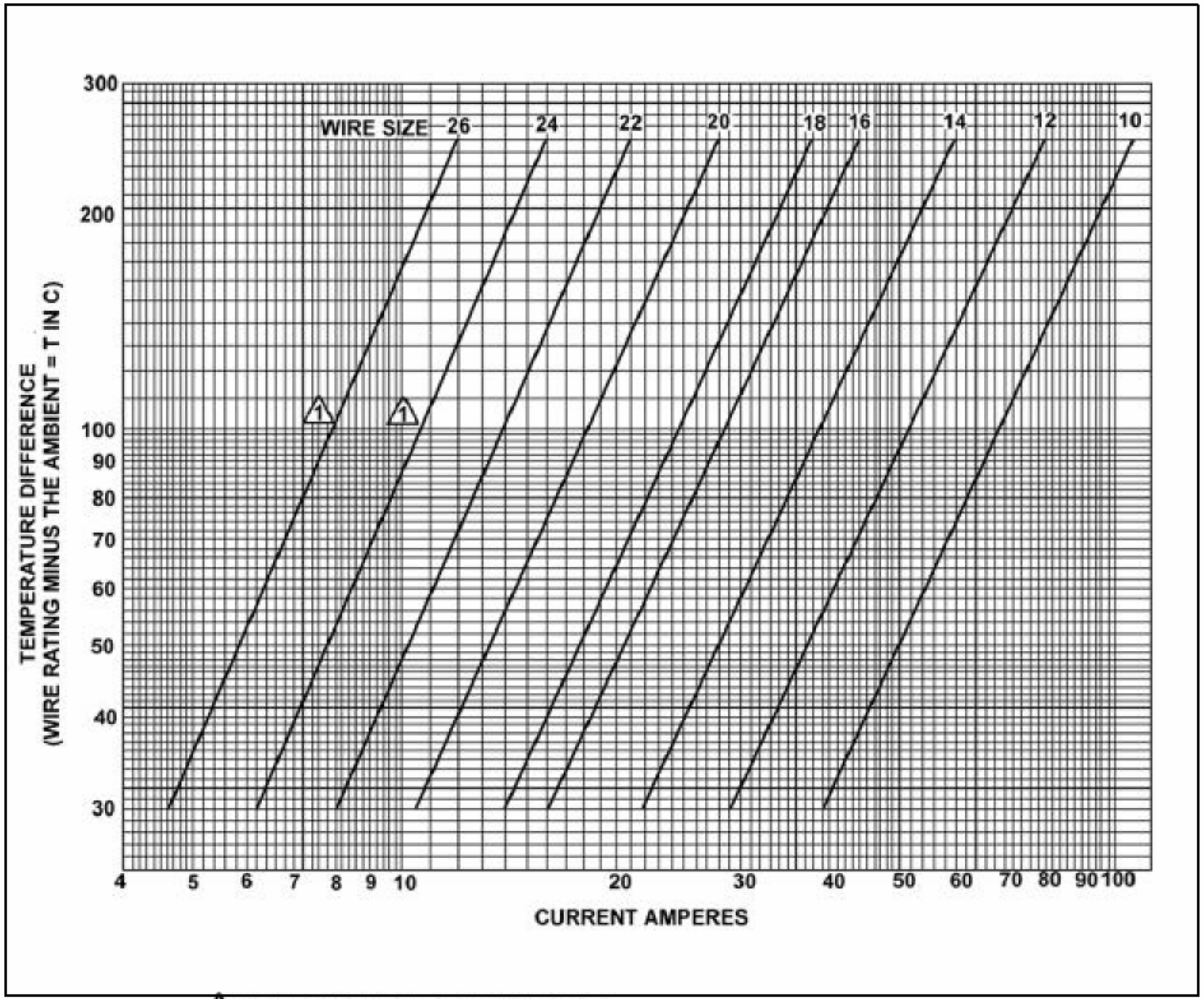
T_1 = 50 °C ambient temperature

T_R = 200 °C maximum conductor rated temperature

I_2 = 20 amps circuit current, continuous

I_{max} = 26 amps (this is the maximum current the #14 gauge wire could carry at 50 °C ambient

AC 43.13-1b, Section 5



⚠1 NOT TO BE USED AS SINGLE WIRE

FIGURE 11-4a. Single copper wire in free air.

AC 43.13-1b, Section 5

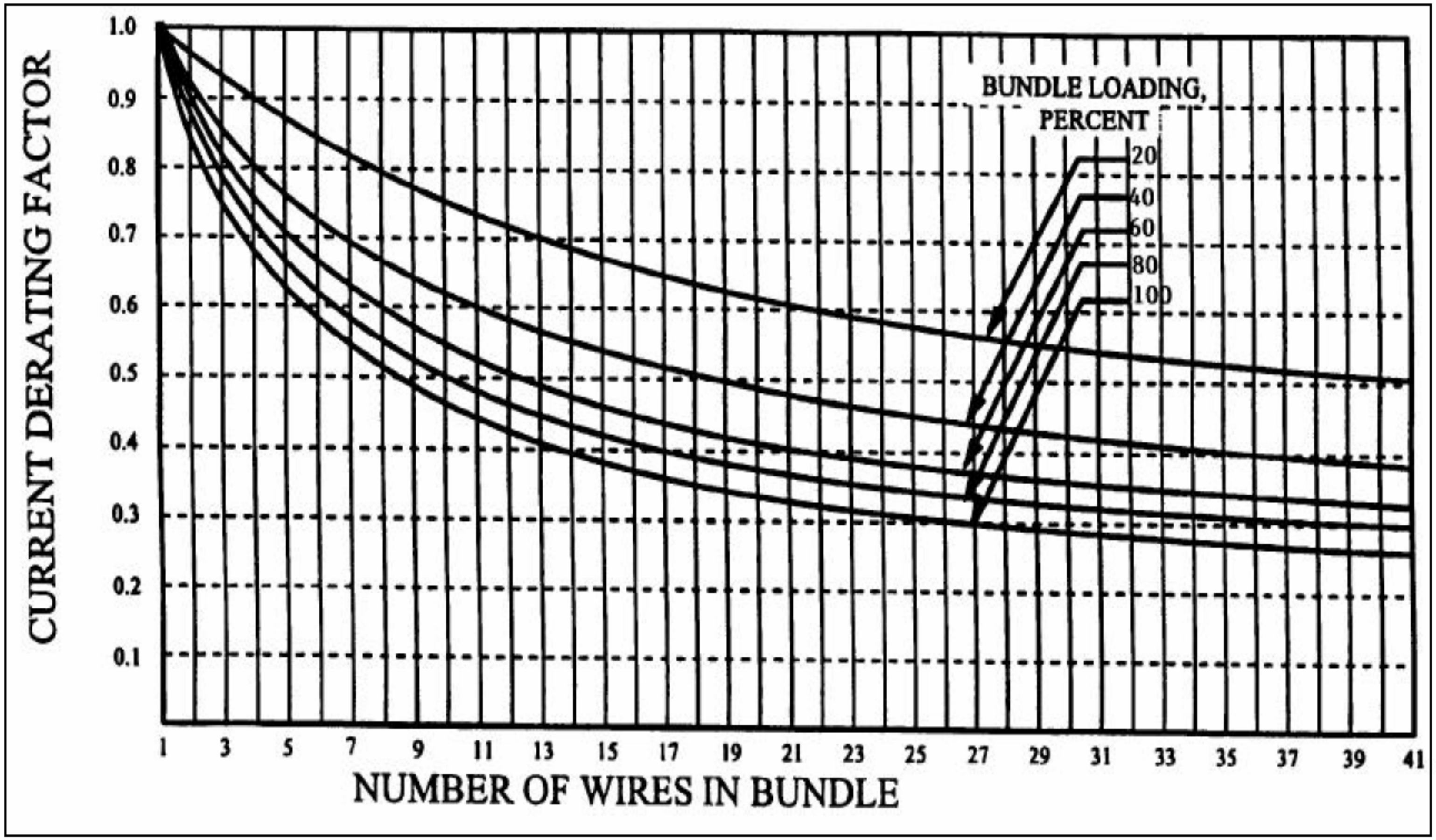


FIGURE 11-5. Bundle derating curves.

AC 43.13-1b, Section 5

STEP 5: To find the total harness capacity, multiply the total number of size #22 wires by the derated capacity (25 x 6.6 = 165.0 amps) and add to that the number of size #20 wires multiplied by the derated capacity (10 x 8.8 = 88 amps) and multiply the sum by the 20 percent harness capacity factor. Thus, the total harness capacity is (165.0 + 88.0) x 0.20 = 50.6 amps. It has been determined that the total harness current should not exceed 50.6 A, size #22 wire should not carry more than 6.6 amps and size #20 wire should not carry more than 8.8 amps.

Other Documents and Standards

Earlier Standard

MILITARY SPECIFICATION

WIRING, AEROSPACE VEHICLE

MIL-W-5088L
10 May 1991
SUPERSEDING
MIL-W-5088K
24 December 1984

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers all aspects from the selection through installation of wiring and wiring devices used in aerospace vehicles. Aerospace vehicles include airplanes, helicopters, lighter-than-air vehicles, and missiles.

NASA Standard

NASA Technical Memorandum 102179

Selection of Wires and Circuit Protective Devices for STS Orbiter Vehicle Payload Electrical Circuits

National Aeronautics and Space Administration
Lyndon B. Johnson Space Center
Houston, Texas

June 1991

Standard Today

SAE Aerospace
An SAE International Group

AEROSPACE STANDARD	AS50881	REV. C
	Issued 1998-04 Revised 2006-10 Superseding AS50881B	

Wiring Aerospace Vehicle

On Line Current Capacity Calculator

http://circuitcalculator.com/wordpress/2007/09/20/wire-parameter-calculator/

Wire Parameter Calculator

September 20, 2007

This Javascript web calculator will calculate the resistance and ampacity for copper wire based on the gauge. Both metric (mm) and American Wire Gauge (AWG) are supported. Note: Ampacity is based on a curve fit to MIL-STD-975. To see the wire table that this calculator is based on as well as important information about wire insulation temperature ratings, click here.

Inputs:

Wire Size	24	AWG

Optional Inputs:

Wire Temperature	50	Deg. C
Wire Length	333	ft
Number of Wires in Bundle	800	

Results (per each wire):

Resistance	9.56	Ohms
Single Wire Ampacity	3.18	Amps
Wire Bundle Ampacity (per wire)	1.59	Amps
Copper Diameter	20.1	mils
Copper Area	317	mils^2
Copper Weight	0.186	kg