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Department of War  
OFFICE OF PREPUBLICATION AND SECURITY REVIEW

SLIDES ONLY

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# Safe-T-Cable® and LaceLok®

## Training

# Agenda

- DMC® History
- Safe-T-Cable®
  - Benefits
  - Materials
  - Tooling
  - Verification Equipment
  - Standards & Classifications
- LaceLok®
  - Disadvantages of Traditional Methods
  - Why Choose LaceLok
  - LaceLok Construction
  - Installation
  - Mil-Spec Information



## MISSION

The trusted provider of tooling and technology for mission-critical electrical systems.

## VISION

To create industry-changing solutions that drive customer success.

## VALUES

- Maintain Customer Focus
- Preserve Family Culture
- Commit to Growth
- Succeed with Honor
  - Hire and Develop the Best
  - Embrace Teamwork & Optimism
  - Retain Organizational Flexibility
  - Adopt Change while Respecting Heritage

# History

## Tooling Support

Our mission is to be your trusted partner in tooling and technology for mission-critical electrical systems. DMC and DMC Europe provides a full catalog of tooling to support EWIS including:

- Crimp Tools & Accessories (qualified to AS22520)
- Insertion/Removal Tools (qualified to AS81969 & AS5259)
- Connector Assembly Tools
- Tensile Test Equipment
- Safe-T-Cable®
- Twist-Strip®
- Lacelok®





**Safe-T-Cable®**

**DMC®**

# Safe-T-Cable Introduction

## History



# Safe-T-Cable Introduction

General Information



# Safe-T-Cable Introduction

## General Information

- User-friendly alternative to lockwire
- Trusted for its reliability for over 30 years
- Commonly used in aircraft engines and airframes
- Proven reliability in Space, Marine, and other harsh environments
- Continued acceptance for quality control and production enhancement



# Safe-T-Cable Benefits

- Reduced installation times
- Access to tight areas
- Quickly learned and repeatable
- Tool-dependent system
- Stronger than wire
- Quick visual inspection
- Improved FOD control



# Safe-T-Cable Material

## Components

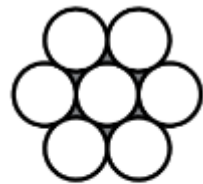
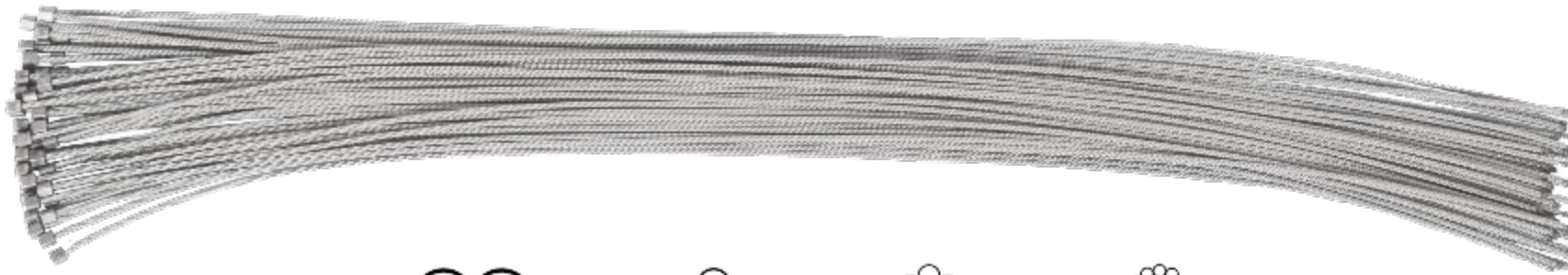
- Safe-T-Cable is comprised of three components: the cable, the end fitting, and the ferrule.
- All three components are made of the same high-performance alloys typically used in aerospace fasteners.
  - 321 Stainless Steel (AS3510) is the standard Safe-T-Cable material used for most engine and airframe applications.
  - Inconel 600 (AS3509) is appropriate for high-temperature and/or non-magnetic applications.
  - Inconel 625 (AS3655) is ideal for marine applications where superior corrosion-resistant properties are necessary.



# Safe-T-Cable Material

## Cable

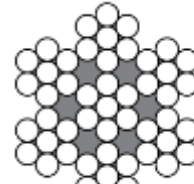
- Available in four diameters
- Available in several lengths ranging from 9" – 24"
- Standard, self-looping jumper, flanged, and custom branded cables are available.



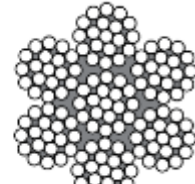
**1 x 7**  
.022"



**3 x 7**  
.032"



**7 x 7**  
.040"



**7 x 19**  
.062"

# Safe-T-Cable Material

## Ferrules

- Individual ferrules are precisely manufactured to a size and hardness ensuring maximum tensile strength and their compatibility with the cable assemblies and tools being used.
- Conveniently stored in a disposable, spring-loaded cartridge
- Easily extracted from the cartridge minimizing the possibility of FOD
- Available in standard, elongated, or flanged configurations



# Safe-T-Cable Material

## Custom-Branded Cable Assemblies

- Custom-branded cable assemblies feature a logo or mark on the end fitting
- Most commonly used for warranty traceability, service location verification, and/or to identify tampering.



# Safe-T-Cable Material

## Elongated Ferrules

- Elongated ferrules are ideal for installations where the clearance between the fastener head and the surface to which the fastener is attached is limited.
- The radius end and longer shape allow for correct alignment between the tool nose and the fastener
- An excellent choice for low-profile fasteners or hard-to-reach areas



# Safe-T-Cable Material

## Self-Looping Jumper Cable

- Self-looping jumper cable assemblies provide the user with a means of anchoring a threaded fastener to almost any structure.
- Clear advantage over lockwire on turnbuckles, castellated fittings, and other applications where holes are not provided



# Safe-T-Cable Tooling

## Overview

- The tool applies the tension, crimps, and cuts the excess cable off
- Adjustable and pre-set tension tools are available
- Manual, battery, and pneumatic power options
- Tools have replaceable noses that can be serviced by the user
- Multiple nose lengths are available to accommodate most applications
- Noses are interchangeable between tools for the same cable size



# Safe-T-Cable Tools

## Adjustable Tension

- Adjustable tension tools are the most popular Safe-T-Cable tools.
- The rotary tension mechanism on this tool can be adjusted to your precise cable tension requirements.
- Ball bearing slip clutch mechanism allow the user to tension the cable



SCTR323

# Safe-T-Cable Tools

## Pre-Set Tension

- Pre-Set tension tools have a factory-set tension and can terminate the cable with a single hand.
- Multiple actuations of the tool handle will draw the cable into the tool until all slack is removed from the cable.
- When the tool senses the correct tension (pre-set at the factory), it will shift into the crimp-cut mode and complete the installation of the Safe-T-Cable® on the next closure of the handle.



SCT403

# Safe-T-Cable Tools

## Pneumatic

- Pneumatic-powered tools are ideal for high-production environments.
- Lightweight
- Ergonomic design
- Available in adjustable tension and pre-set tension options
- Accommodate .022", .032", and .040" size cable



SCTPRM323

# Safe-T-Cable Tools

## Battery Powered

- Battery-powered tools make crimping cable easier and faster, while also improving operator ergonomics.
- Available in adjustable tension versions
- Covers all cable sizes
  - .022", .032", .040", and .062"
- New features allow the operator to track tool performance, users, and projects. Crimp data is viewable in real-time on the LED display, or can be downloaded via Bluetooth® to an app.



SCTE323C

SCTE625C

# Verification Equipment

## Verification Block

- The torque verification block and a push force tester are used to periodically check the tensioning mechanisms.
- This verification equipment is intended to apply the minimum pull-off loads while ensuring flex limits are met.



# Verification Equipment

## Motorized Pull Tester

- A motorized pull tester, MPT-250C-SC, may be used to capture and export data from tool indenter setting tests.
- The MPT-250C-SC is made up of the MPT-250C and 15-3318 grip set and is used for tensile testing .022", .032", and .040" Safe-T-Cable.

MPT-250C  
& 15-3318



# Verification Equipment

## Spanner Wrench

- Crimp depth may be adjusted by the user
- The Spanner tool is used to unlock the adjustment screw
- Operators can tighten/loosen the adjustment screw behind the tool nose



SCT32084

# Standards and Classifications

## NAS and SAE



- National Aerospace Standards
  - NASM33540 (MIL-STD-33540) "Safety Wiring, Safety Cabling, Cotter Pinning, General Practices"
- SAE International
  - AS567 Safety Cable, Safety Wire, Key Washers, and Cotter Pins for Production Systems, and Use
  - AS3509 Cable, Safety, Kit, Nickel Alloy, UNS N06600
  - AS3510 Cable, Safety, Kit, Corrosion and Heat-Resistant Steel, UNS S32100
  - AS3618 Cable, Safety, Ferrule, Elongated, Corrosion and Heat-Resistant Steel, UNS S32100
  - AS3619 Cable, Safety, Ferrule, Elongated, Nickel Alloy, UNS N06600
  - AS3655 Cable, Safety, Kit, Corrosion Resistant Nickel Alloy, UNS N06625
  - AS4536 Cable, Safety, Kit, Procurement Specification for Requirements and Use

# Standards and Classifications

## U.S. Military Use

- Safe-T-Cable is included in many technical manuals (TM) and technical orders (TO) used by the U.S. military and foreign military sales organizations to support aircraft, aerospace, and defense systems.
- TO-1-1A-8
- TO-1-1A-14
- TO-1-1A-15
- TM 1-1500-204-23-6
- TM 1-1500-323-24-1
- NAVAIR 01-1A-505-1
- NAVSEA MIL-STD-763
- ARMY MICOM, Drawing 13210868
- NA 01-1A-505-1
- NA 01-1A-8
- TO 00-25-255-1
- TM 1-1500-323-24-2

# Standards and Classifications

## Commercial and OEM Use

- GE Aircraft Engines: 70-11-01-400-005 “Standard Practices Manual”
- Pratt & Whitney: PWA 316 “Safety Wire, Safe-T-Cable and Cotter-pin Installation”
- Rolls Royce: JES 138 “Locking Devices and Practices”
- Boeing: BAC 5018 “Installation of Safelying Devices”
- Airbus: AIPI 03-06-003 “Locking by Wire”
- NASA: CR4473 “Test Plan and Report”

A hand is shown using a black and grey DMC LaceLok tool to secure a white cable into a patch panel. The tool is labeled "DLT-1100 (M32555/01-01) DMC's LaceLok TOOL". The patch panel has various labels including "06AR", "20\"", "R-GND", "OR", and "06AF". The background shows a dense array of cables and panels in a server room.

# LaceLok®

**DMC**®



# What is LaceLok?

- LaceLok was designed to replace hand-tied lace and cable ties for secondary wire harness support
- Combines the ease of zip ties with the performance of string ties
- Developed by Ideal Industries in 2012
- Acquired and perfected by DMC in 2022
- Mil-Spec Qualified since Dec. 2022
- Listed in SAE AS50881H since Jan. 2023

# Disadvantages of Traditional Methods

## Hand-Tied Lace

- Applied inconsistently
- Loosen and slide over time
- Repetitive motion injuries
- Abrasion to operators
- Operator fatigue

## Zip Ties

- Becomes brittle when exposed to extreme temperatures, chemicals & UV
- Often over tensioned
- Abrasive to wires and nearby components
- AS50881H
- MIL-DTL-32554
- MIL-DTL-32555
- NAVAIR 01-1A-505-1, TO 1-1A-14, & TM 1-1500-323-24-1



# Why LaceLok?

## Top Benefits of LaceLok

### Superior

- Rated for operation in extreme temperatures - 65°C to 260°C
- Hydraulic fluid, lubricating oil, and fuel resistant
- Made of abrasion resistant meta-aramid fiber lace
- 40% lighter than large cable ties

### Consistent

- Delivers consistent loop force controlled by the fastener
- Terminates consistently at 20 lbs (+/- 2 lbs) of applied tension
- Installs up to 3x faster than most hand-tied lace
- Prevents rework

### Safer

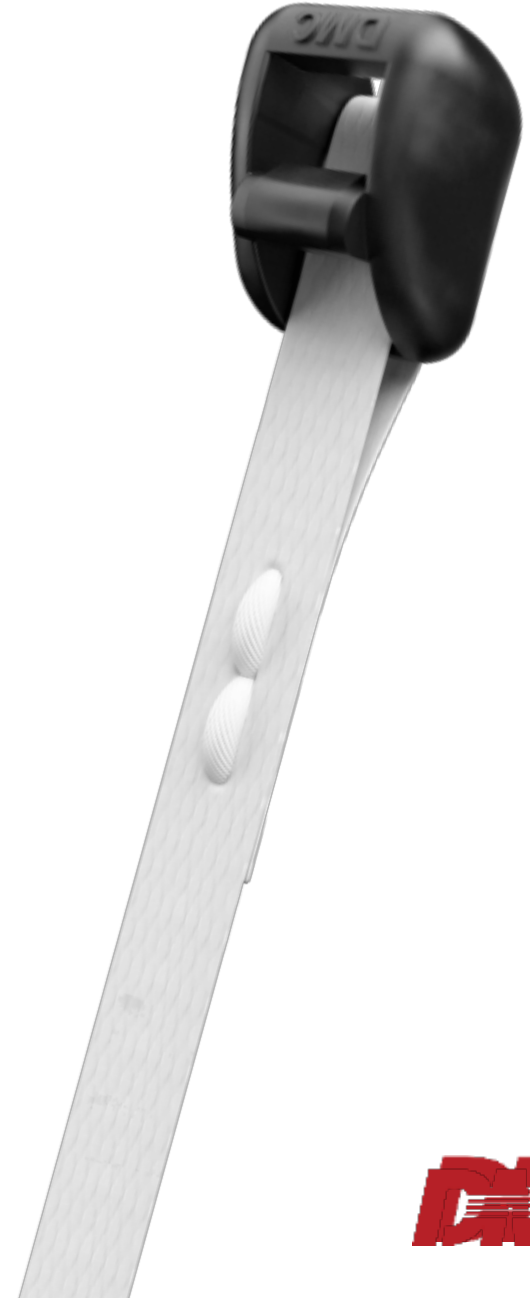
- Reduces repetitive motion and abrasion injuries
- Reduces operator fatigue



# LaceLok Construction

What is LaceLok Made of?

- Lacing Tape
  - Meta-Aramid fiber lace
  - Meets A-A-52084 Lacing Spec
- Fastener
  - High-performance thermoplastic PEEK material
  - Locking pin activates at 20 lbs (+/- 2 lbs) of tension
- Thread
  - Meets MIL-C-572
  - Secures the fastener to the lace until it is activated



# LaceLok Construction

## Options Available for Purchase

- LaceLok is available in various lengths and colors and is sold in quantities of 100.
- 6", 10", 18", and 24" lengths
- Natural, Natural w/Dark Tracer, Black, Blue, Brown, Grey, Green, Orange, Pink, Red, and Violet
- Common options are natural 10" (LF2-10NA1) and 18" (LF2-18NA1)





# Installation

How to Use LaceLok

1



2



3



4



**DMC**



# Mil-Spec Numbers

- AS50881H
- MIL-DTL-32554
- MIL-DTL-32555
- MIL-HDBK-522
- NAVAIR 01-1A-505-1
- TO 1-1A-14
- TM 1-1500-323-24-1



# Thank You

