



LEKTRO

Towbarless Tow Vehicles

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- A faded background image showing a forklift operator in a white shirt and dark pants loading a large, white, cylindrical object onto the back of a dark-colored truck. The truck is parked on an airfield tarmac. In the background, there are other aircraft and airport buildings under a clear sky. The word 'Callaway' is visible on the side of the truck's cargo area.
1. History / Introduction
 2. Advantages of *LEKTRO* TTV
 3. Partial List of Current Military Customers
 4. Summary / Closing Comments

Briefing Outline ₂

- Towbarless towing has been in use since 1967, initially used with corporate aircraft



- Towbarless towing has been used by commercial airlines worldwide since the mid-1980s



LEKTRO HISTORY 4

- Today, military operators and aircraft manufacturers around the world use towbarless tractors:



LEKTRO HISTORY ₅

- **Universal Capability - One tug can handle all aircraft**
- **Sustainability**
- **Cost Effective**
- **Multiple Fuel Sources**
- **Requires Less Training**
- **Enhanced Readiness - Easy to Deploy**
- **Low Environmental Impact**
- **Highly Maneuverable**
- **Safety – Reduced Personnel Injuries/Aircraft Damage**
- **Easy Operation**
- **Facility Cost Savings**

The ***LEKTRO*** Advantage ⁶



Universality/Capability

- One tug can handle all aircraft

The *LEKTRO* Advantage ₇

AP8850SDA-M with A-10



AP8850SDA-M with F-15



AP8850SDA-M with F-16



AP8850SDA-M with F-18



AP8850SDA-M with JAS 39 Gripen



AP8850SDA-M with French Rafale



AP8850SDA-M with Eurofighter





Universality/Capability

- No need for towbars

The *LEKTRO* Advantage₁₅





Universality/Capability

- Is ideal for emergency or unexpected aircraft-type

The *LEKTRO* Advantage₁₇



Sustainability

- No towbars which require maintenance/replacement
- Capable of operating in all weather conditions
 - Enhanced traction on slippery surfaces
 - Not affected by heat

The ***LEKTRO*** Advantage ¹⁸

To Whom it may concern:

We confirm we have been using the Lektro electric drive towbarless tractor since 2010 and the unit has performed well and meets our expectations. The unit has performed reliably and the spare parts support is quick and efficient.

The Lektro unit maintains its performance in the hot and humid conditions in Thailand.

Your sincerely,



Derek Middleton
Director of Maintenance

Cost-Effective

- Procurement
 - Does not require the purchase of corresponding towbars and tow heads
- Sustainment
 - Does not require the expense and time spent performing combustion engine maintenance
 - Routine maintenance includes only:
 - Charging the batteries
 - Filling the batteries with water
 - Maintaining a few grease points

The ***LEKTRO*** Advantage₂₀



Potential for Multiple Fuel Sources

- All-electric
- Hybrid (Diesel/Electric)

The ***LEKTRO*** Advantage₂₁

Charging Can Be Adapted to Various Power Sources

- Quick charging options
- 50 Hz / 60 Hz
- 220-480 Volts AC
- Single-Phase / Three-Phase

The ***LEKTRO*** Advantage₂₂

Requires Less Training

- Operation
 - Much easier to learn to operate a LEKTRO than conventional tractors (Approximately 1/10 of the time is required)
- Maintenance
 - Fewer components and systems to maintain
 - Less-complicated components
 - Three basic components:
 - Battery
 - Electric motor
 - Controller

The ***LEKTRO*** Advantage₂₃

Easy to Deploy

- No towbars to haul
 - Saves pallet position
- Is a significantly lighter to transport since the tow vehicle weight is supplemented by aircraft nose-weight
 - Conventional Towbar Tug is heavy at all times
- Steer Axle Lift
 - Navigate transport aircraft ramps
- One pallet position
- NATO tie-downs



The ***LEKTRO*** Advantage₂₄











Low Environmental Impact

- Emission-Free
- Batteries fully recyclable
 - Acid can be neutralized
 - Lead is recyclable
 - Rubber is recyclable
 - Steel case is recyclable

The ***LEKTRO*** Advantage₃₀



Highly Maneuverable / Aircraft Safety Increased

- Ability to position aircraft in confined areas

The *LEKTRO* Advantage₃₁





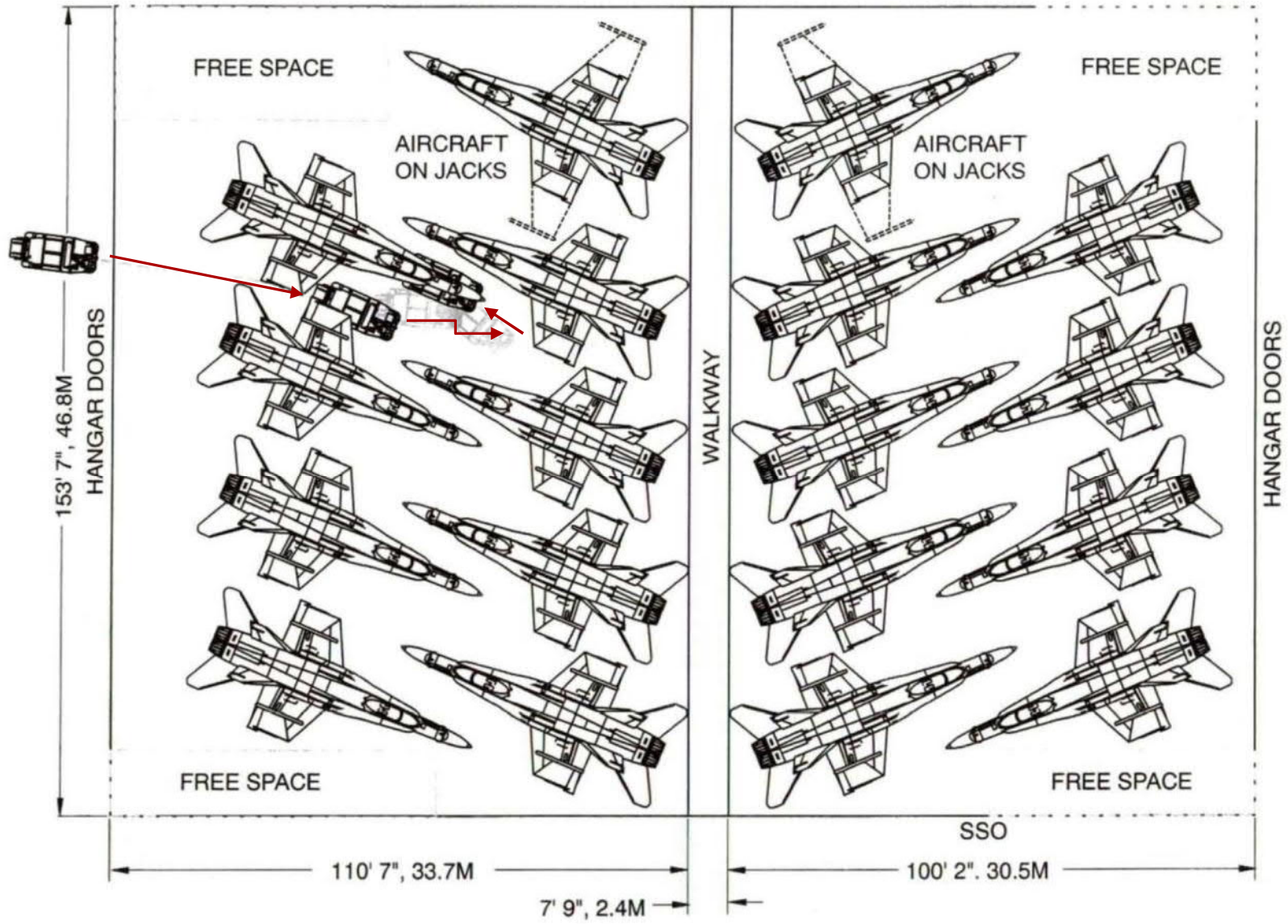
Highly Maneuverable / Aircraft Safety Increased

- Increased hangar capacity
- More aircraft can be stored inside
 - Reduces aircraft maintenance
 - Reduces aircraft exposure to elements
- Reduces “Hangar Rash”

The *LEKTRO* Advantage₃₃

AIRCRAFT ANGLED

ALLOWS 2' CLEARANCE



CFB COLD LAKE

HANGAR DENSITY STUDY

WITH LEKTRO AP8850SDA TOWBARLESS TUG



Highly Maneuverable / Aircraft Safety Increased

- Simplifies the connection between the aircraft and tow vehicle by reducing from the standard 2 pivot-point connection to a single pivot-point, completely eliminating the possibility of jack-knifing.
- Utilizes NLG weight to increase traction

The ***LEKTRO*** Advantage₃₅

Personnel Safety Increased

- Eliminates back injuries from handling heavy towbars
- Eliminates pinched/broken finger injuries associated with connecting towbar to tug/aircraft
- No fumes
 - Personnel not subjected to CO exhaust emissions
 - Can be operated inside hangar with doors closed
- No Noise
 - Personnel can easily communicate with each other to avoid possible accidents

The ***LEKTRO*** Advantage₃₆

Easy Operation

- Fewer personnel required
 - Single operator can safely complete capture process
 - Eliminates need for brake-rider in aircraft
- Faster hook-up time
- No towbar/tow head required
- Single pivot point = increased/easy maneuverability

The ***LEKTRO*** Advantage₃₇

Maintenance Advantages

- Batteries have been known to last 14-18 years in high-use airline applications before needing replacement
- Eliminates possibility of towbar/shear-pin breakage
- No tune-ups required
- No starters, spark plugs, carburetors, etc.
- No oil-changes required
- Easily accessible
- Solid State
- Simple
- Central battery water fill system

The ***LEKTRO*** Advantage₃₈

Facility Savings

- Electric LEKTRO can operate in a closed hangar reducing heating/cooling cost associated with open doors
- Hangars can be smaller as towbarless LEKTROs are much more maneuverable than tug/towbar combination
- No need to purchase/stock engine oil or tug fuel

The *LEKTRO* Advantage₃₉

Partial List of LEKTRO's Current Military Customers

- Belgian Air Component (F-16)
- Boeing (F-15 & F/A-18)
- Canadian Air Force (CF-18)
- Finnish Air Force (F-18)
- Kingdom of Saudi Arabia Ministry of Defense and Aviation
- Nigerian Air Force (C-130)
- Pakistan Army Aviation
- Royal Malaysian Air Force
- Royal Thai Air Force
- Republic of Singapore Air Force (F-15SG)
- Swiss Air Force (F-18)
- United States Air Force (F-15, C-130)
- US ANG (F-15, F-16, A-10, C-130)

Summary of *LEKTRO* Towbarless Tug Benefits

- Reduces time and manpower required to handle aircraft
- Reduces potential for aircraft damage
- Increases personnel safety
- Increases hangar density
- Reduces aircraft exposure to elements
- Reduces cost of transport
- Reduces hangar heating/cooling cost
- Eliminates need to purchase/maintain towbars
- Reduces tug maintenance costs

Summary

- a. With over 5,200 units currently in operation around the world, LEKTRO is the world leader in all-electric towbarless towing.
- b. LEKTRO's long-term history and broad base of world-wide customers has resulted in a product that is highly-versatile, safe, efficient, and easy to use.
- c. LEKTRO equipment has universally been found to reduce operational cost while increasing operational safety and efficiency.



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