PUSHBACK

TOWING CAPACITY:
NARROW BODIES AND REGIONAL AIRCRAFT
95 t (209,400lbs)

The safest and most efficient pushback system.
Pushback aircraft electrically.

2019 PRODUCT LEADER OF THE YEAR
www.aviationspro.com

mototok
easy moving

5010-190528


UUE
G-EUPX
PB0004
BRITISH AIRWAYS
mototok
easy moving
PB0004

Reduce the time of waiting for pushing back the aircraft!

Every minute of waiting for a pushback tug is expensive.

British Airways reduces the pushback delay at London Heathrow T5 by up to 70 %.

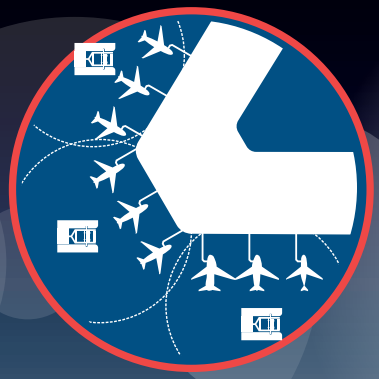
Fever delays means less costs and less emissions.

Only 2 hours of training required.

Only specialized and authorized staff is permitted to push back aircraft with a conventional pushback tug.

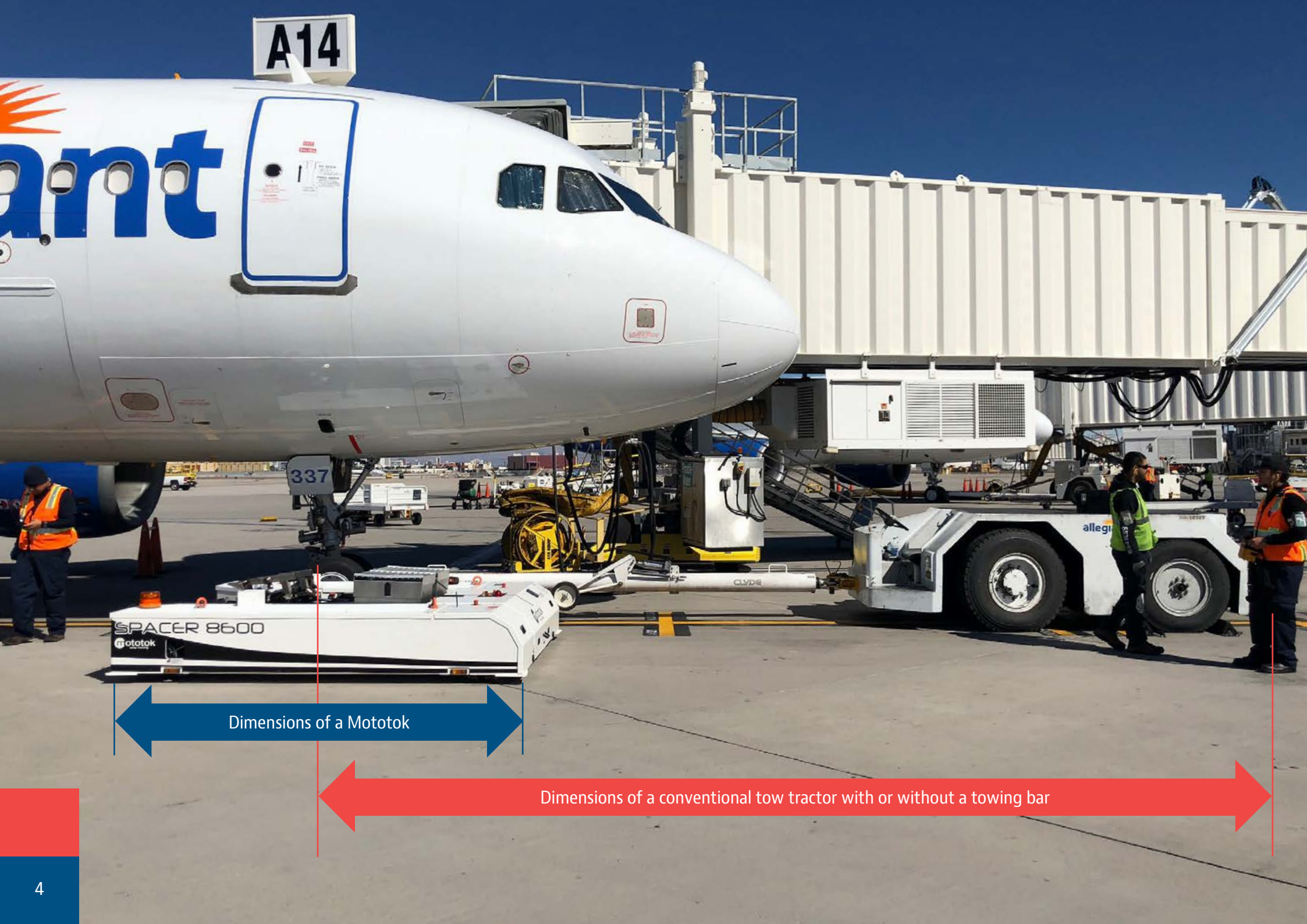
Mototoks can be operated by everyone of the ground handling staff without the need of a driving license.

Get access to a pushback tug immediately!



Our concept is to equip every third boarding bridge with a Mototok to ensure fast and direct access to a pushback tug.

Exactly when it's needed – without delays.


A14
337
SPACER 8600
Dimensions of a Mototok
Dimensions of a conventional tow tractor with or without a towing bar

The view outside a standard pushback tug.

Normally minimum 2 Persons are required for pushing back an aircraft with a conventional tug: A wing-walker and a specially trained and authorized pushback operator.

With Mototok only one person is able to maneuver the aircraft – far away from the engines and with a huge circumferential view around the aircraft.


PB0004
mototok

This is our concept:
The Mototok principle – Circumferential all around view

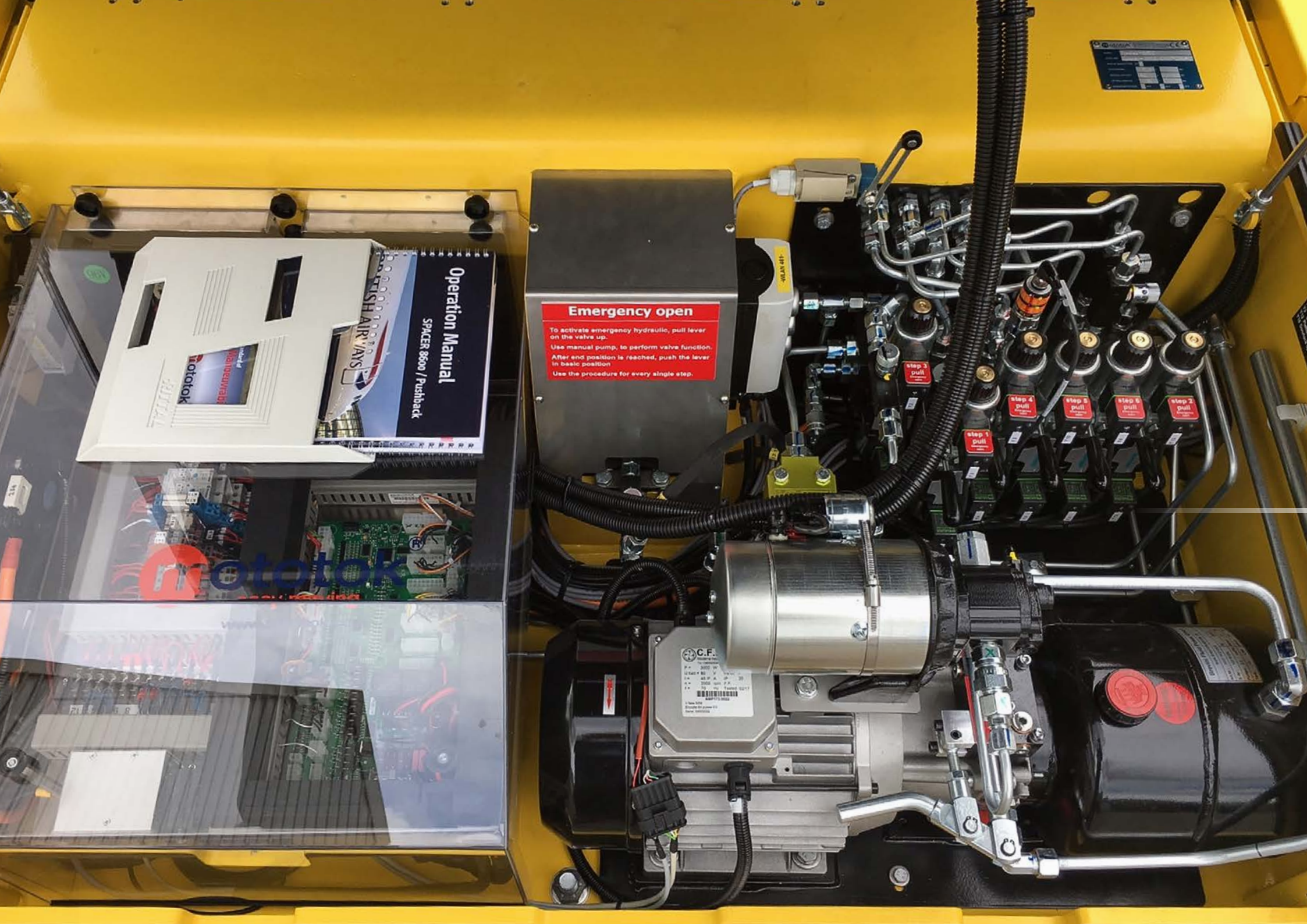
Due to wireless remote control the operator can stand far away from the turbines and the machine. He has a complete and circumferential view all around the aircraft during the whole pushback process.


mototok
easy moving
Fraport
R3

SPACER 8600.
Pushback Operations made easy.

- Full electric drive
- Wireless remotely controlled
- Only one person needed
- One-click-loading system
- No driving license required
- 2 hours operational Training
- Reduce delays
- One Mototok for 1-5 Boarding bridges
- Compact design
- Recharging time: about 3 hours
- 30 to 50 pushbacks with one charge
- Very low maintenance costs
- Green Energy: No fuel costs
- I-NPS: Oversteer Protection

Video:
www.bit.ly/mototok-pb


Operation Manual
SPACER 8600 / Pushback
Emergency open
To activate emergency hydraulic, pull lever on the valve up.
Use manual pump, to perform valve function.
After end position is reached, push the lever in basic position
Use the procedure for every single step.
step 1 pull
step 2 pull
step 3 pull
step 4 pull
step 5 pull
step 6 pull
mototok

ADVANTAGE 1:
Enormous savings on operational and maintenance costs.

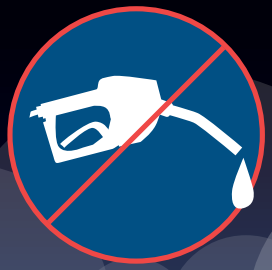
Very low maintenance costs

Compared to conventional drives, an electric drive has significantly fewer moving components. Therefore the maintenance costs are much lower compared to a conventional tractor.

All important electrical and hydraulic components are located in a single compartment – making maintenance considerably easier.

No fuel costs

The costs for maintenance, repair and energy are **less than 0,90 € for a pushback** – based on 986 pushes per month or approximately 33 per day.



Green energy – less emissions

Reduction in CO_2 emissions
Reduction in NO_x emissions
Reduction in ultra-fine particulate emission
Reduction in heavy vehicle movements


Mototok-Operator
Mototok-Operator
Mototok-Operator
mototok
PUSHBACK OPERATOR
mototok
PUSHBACK OPERATOR

ADVANTAGE 2:
Enormous savings on staff and personal costs thanks to safe one-man-operation.

Only one man needed for operation

Thanks to the remote control, the operator has an excellent all-round view: the operator is his own wing-walker. This avoids possible communication problems between the additional wing-walker, which is no longer necessary, and the operator.

Additionally, the operator is always connected to the pilot via the headset. The communication paths on the airfield during the pushback are reduced to a minimum.

Convenient, quick and easy

By tapping a button on the remote, the loading process of the nose gear will start automatically. This is a process of about 10-15 seconds – ready for take-off.

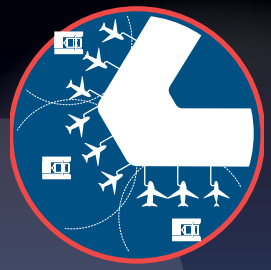
No driving license required

Any ground crew member can push back the aircraft. A short introduction and a operational training of about 2-3 hours is sufficient. This gives you more flexibility in personnel resource planning.

In addition, you do not have to wait for a conventional tug driver with a driving licence. This explains the significant decrease in delays due to waiting times for the conventional pushback tug.


HSBC
HSBC
BRITISH AIRWAYS

ADVANTAGE 3:
Pushback ready anytime!

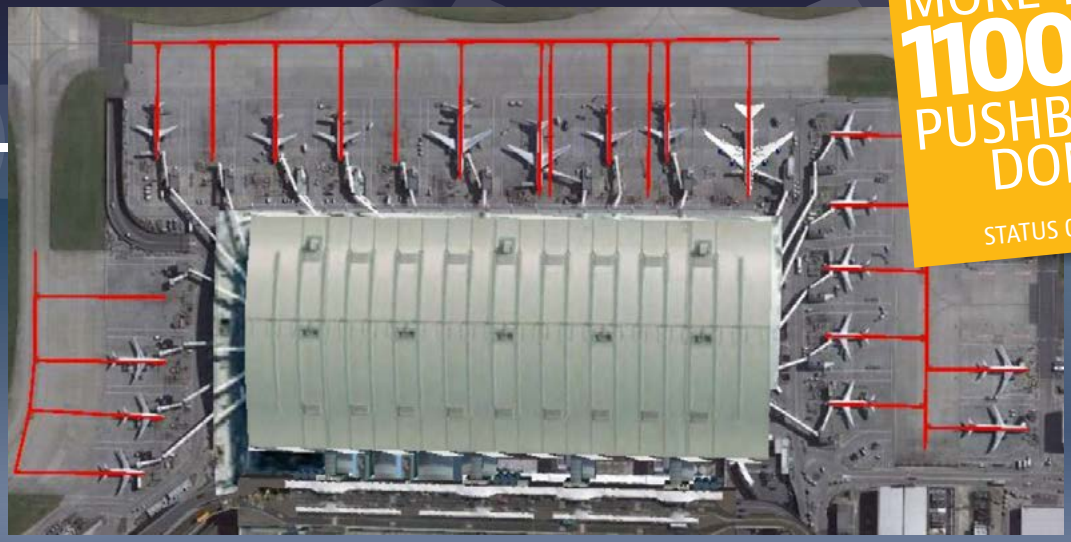


One Mototok Pushback Tug for three Boarding Bridges

Use a Mototok for up to three boarding bridges to get a fast and direct access to a pushback tug. The Mototok is always in place and available when you need it. Since no official driving licence is required, any trained ground staff member can carry out the pushback.

Exactly when it's needed – without delays.

Yesterday's world of London Heathrow Airport: 12 hour heatmap of TBL 280 movements



Today's world of London Heathrow Airport T5: Heatmap of Mototok movements

MORE THAN **110000** PUSHBACKS DONE

STATUS 05/2019


Hainan Airlines 空航南海
HNA
5712
ototok
80%
TORQUE
LIMIT
REACHED
COUNTERSTEERING

ADVANTAGE 4:
Oversteering was yesterday.

Equipped with I-NPS – the intelligent oversteering protection system

The Mototok's I-NPS prevents an oversteer incident through intelligent torque measurement and automatic counter-steering. When the measured torque reaches a critical value of the set torque limit, counter-steering is performed immediately. The torques occurring at the nose wheel are saved in a log file and can be read out and evaluated by authorized personnel at any time.

No more flight delays due to broken shear pins or oversteer occurrences

The occurrence of an oversteering normally means an immediate standstill of the aircraft until the cause of the occurrence has been clarified. A conventional tow tractor – regardless of whether it is towbarless or not – cannot prevent oversteering, it can only indicate it.

Mototok takes a completely new approach: Equipped with our **I-NPS** – the **Intelligent Oversteer Protection System** – oversteering is virtually impossible. The system actively intervenes in the controls as soon as a critical value of the torque at the nose gear is measured or exceeded.


CC
SPACER 8600
MENZIES
AVIATION
TCR
10 032019
mototok
easy moving
CAUTION

Advantages for the Ground Handling Company

- Enormous cost reduction:
  - staff
  - operational cost (fuel)
  - maintenance cost (parts, downtime)
- Staff planning becomes more easy and flexible
- Training costs for new staff members are low
- Reduced complexity of workforce planning: Equipment and personnel are always available – just in time.

Advantages for the Airline

- Safe one-man-operations – more and more airlines will agree
- No change of the Pushback procedure from the view of a pilot
- No delays anymore: The tug and the driver are always available
- Less kerosene consumption because there is no waiting time for a conventional pushback tug

Advantages for the Airport

- 100 % green operation – no hybrid, no diesel.
- Reduces the emission of carbon dioxide (CO_2), both from the towing vehicle and from the aircraft's turbines, while waiting for the pushback
- More safety through total overview of the operator
- No more flight delays by waiting for an conventional tug – the equipment and personnel are always available – just in time


A/RPRO
REMOVE PLUG
BEFORE USE

Also for use in harsh contitions.
Bad weather? Snow and ice? De-icing? No problem.

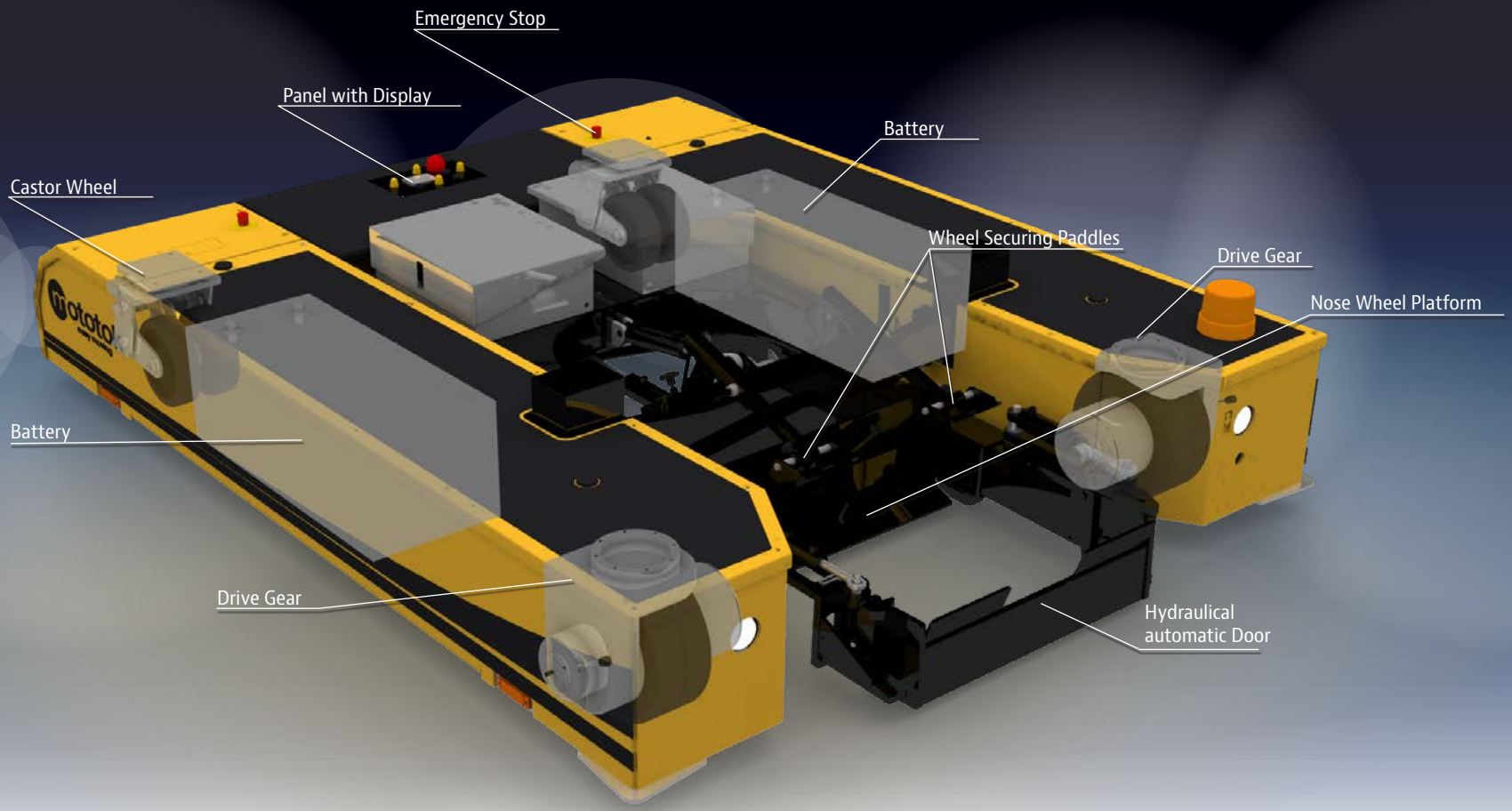
In bad weather conditions the Mototok remains safe and ready for action. Rain, snow and ice – no problem.

The de-icing of the aircraft can also be done with the help of a Mototok.

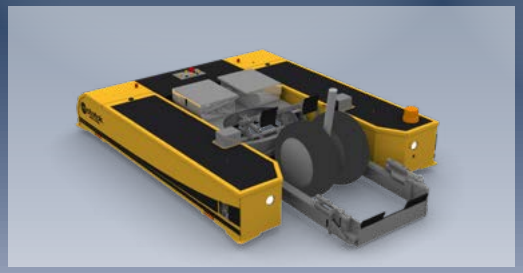

Lufthansa
Airbus A320-200
Fraport
mototok

MOTOTOK IN DETAIL

The Mototok Principle – How it works.



The Mototok Principle – Operating procedures.



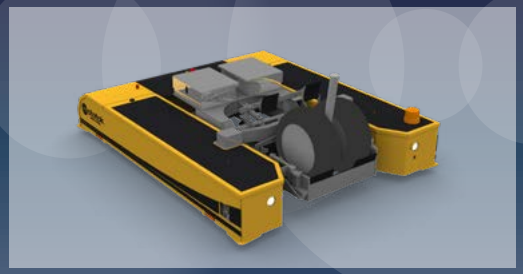
Engaging and Disengaging the Nose Wheel

The engaging procedure can be started automatically by pressing just one button on the remote control:

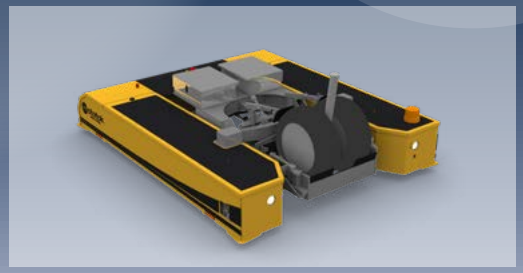
1. Drive the Mototok with the hydraulic door open and the platform lowered to the nose wheel of the aircraft until the nose wheel touches the sliding table. Then press the start button on the remote control.

2. The hydraulical door closes ...

3. ... and clamps the nose wheel with a specified pressure.



4. The platform lifts up and raises the nose wheel



5. The securing paddles lower down automaticly and clamp the nose gear gently and safely – ready for moving the aircraft.

   The whole procedure takes only 10-15 seconds.

Video:
www.bit.ly/mototok-easy

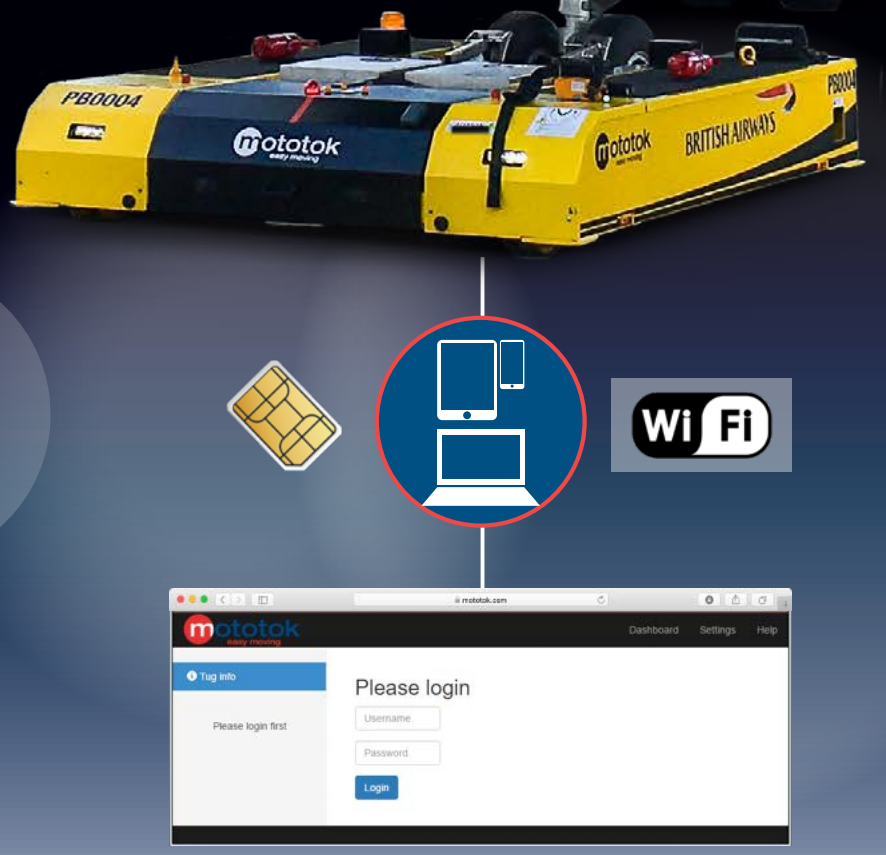
The Mototok central processing unit: Mototok is digital!

Mototok comes with a central processing unit (CPU) for features and adjustments relating to

- Towing and braking forces
- Oversteering protection and counter steering
- Voice announcements
- Unit diagnostics
- Log files
- User access

The CPU can connect to any mobile device (smartphone, tablet or laptop) via Bluetooth, WLAN or USB and a standard Internet browser (such as Microsoft Edge, Apple Safari, Google Chrome or Mozilla Firefox). Once connected to the system, you can manage many types of Mototok settings.

In addition, remote maintenance allows Mototok technicians to assist you with settings and maintenance.

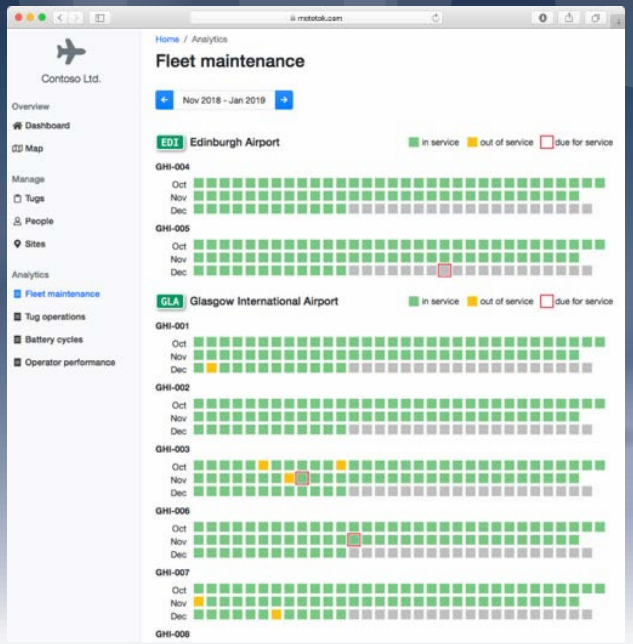


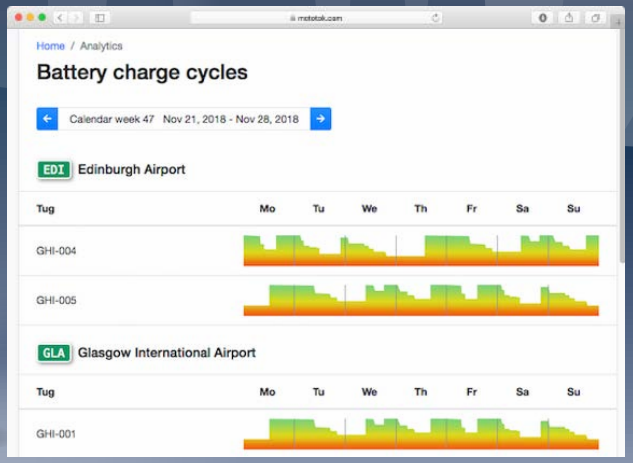
Authoriz ation to use the Mototok

The fastest way to login is to use an RFCI card and an appropriate card reader on the machine. Depending on the authorization level, the user can move the Mototok, check or adjust the settings or read out the log files.

Everything in sight – from everywhere.

Always receive information about the condition and the battery status, the location and activities of each Mototok in your fleet.





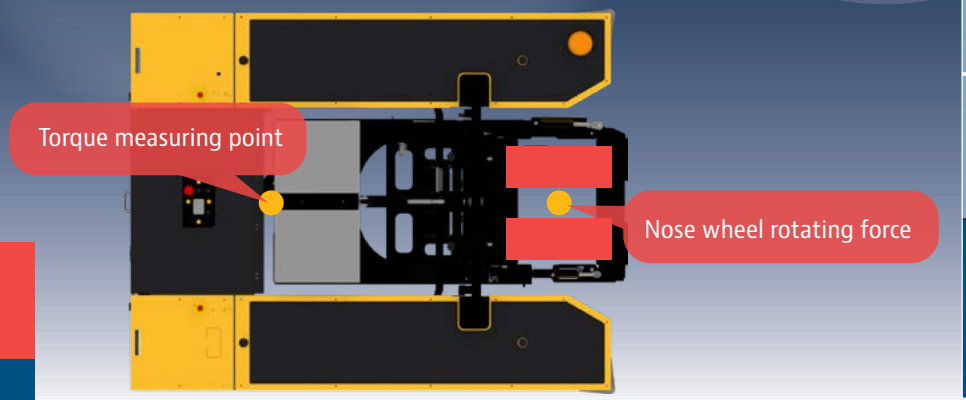
Safety first: I-NPS – Intelligent Oversteering Protection System

Achieve more safety in your daily operations: Our Intelligent Oversteer Protection System (I-NPS) with automatic counter-steering function is our latest contribution to preventing damage to the nose gear during shunting and pushback operation – **the only one worldwide!**

Equipped with several sensors that measure the forces and torques on the nose gear, Motokok's counter-steering algorithm starts when the torque reaches a set limit. This prevents damage to the sensitive nose gear.

The difference to conventional oversteering protection systems

The occurrence of an oversteering normally means an immediate standstill of the aircraft until the cause of the occurrence has been clarified. A conventional tow tractor – regardless of whether it is towbarless or not – cannot prevent oversteering, it can only indicate it. Mototok takes a completely new approach: Equipped with our I-NPS – the Intelligent Oversteer Protection System – oversteering is virtually impossible.

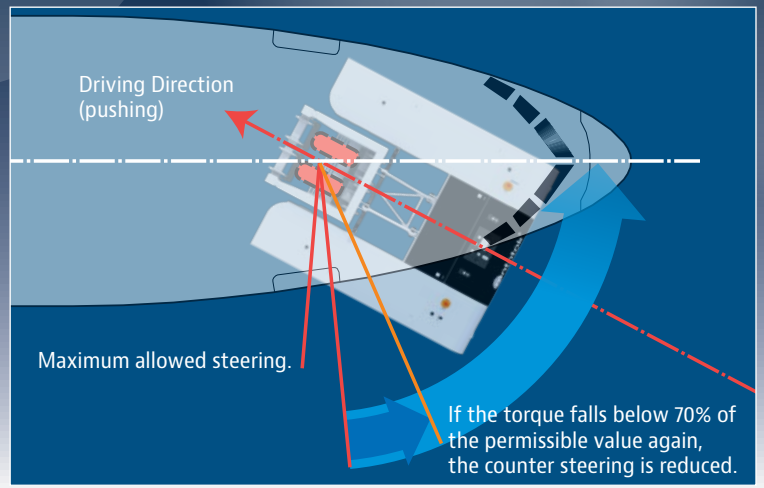


How this works

The Mototok's I-NPS prevents an oversteer incident through intelligent torque measurement and automatic counter-steering. When the measured torque reaches a critical value of the set torque limit, counter-steering is performed immediately. The torques occurring at the nose wheel are saved in a log file and can be read out and evaluated by authorized personnel at any time.

Intuitive and easy handling

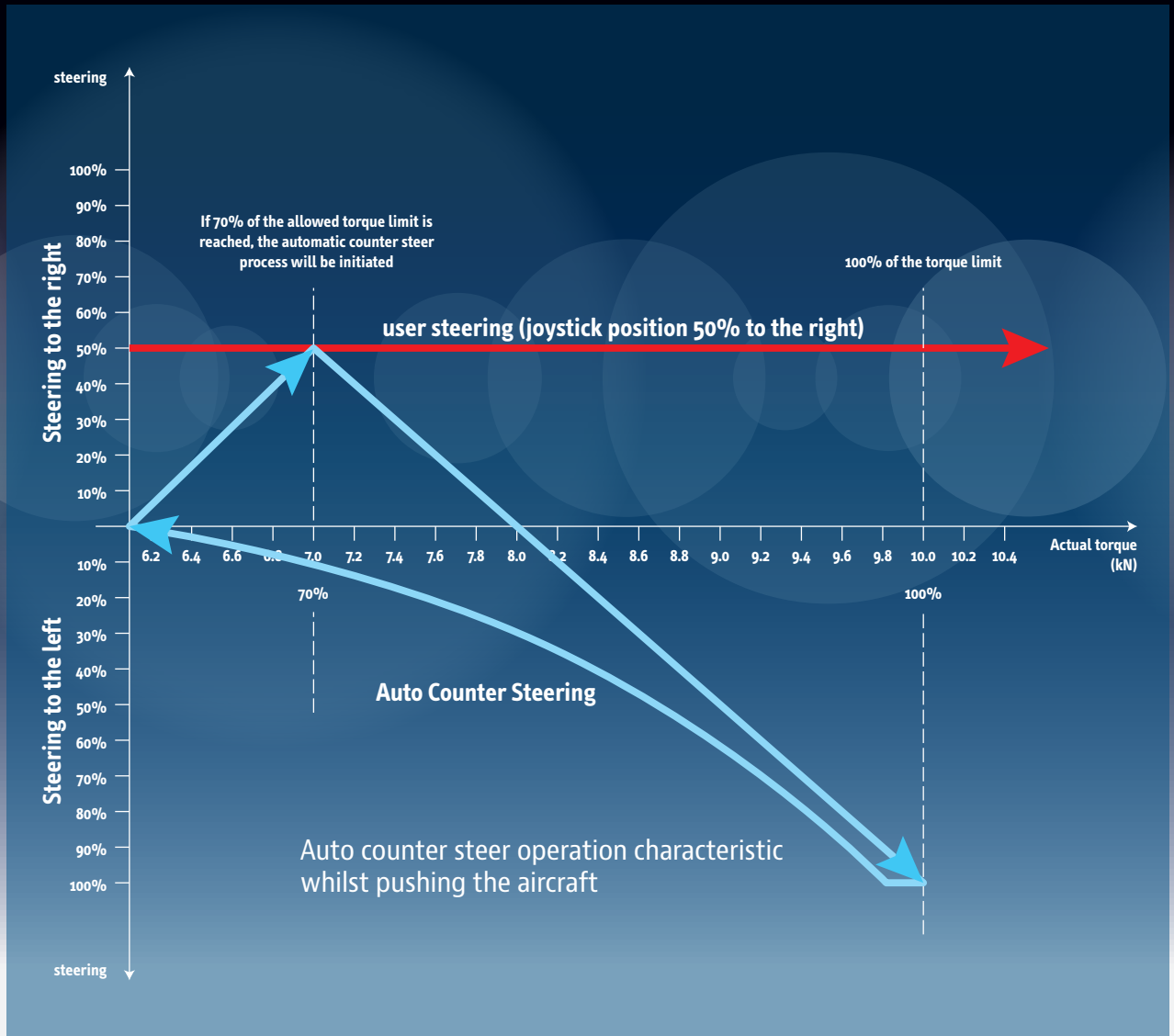
- Information for operators over the display of the Mototok and over electronic speech synthesis with the wireless headset (optional)
- Information for technicians over Mototok App with Laptop or tablet



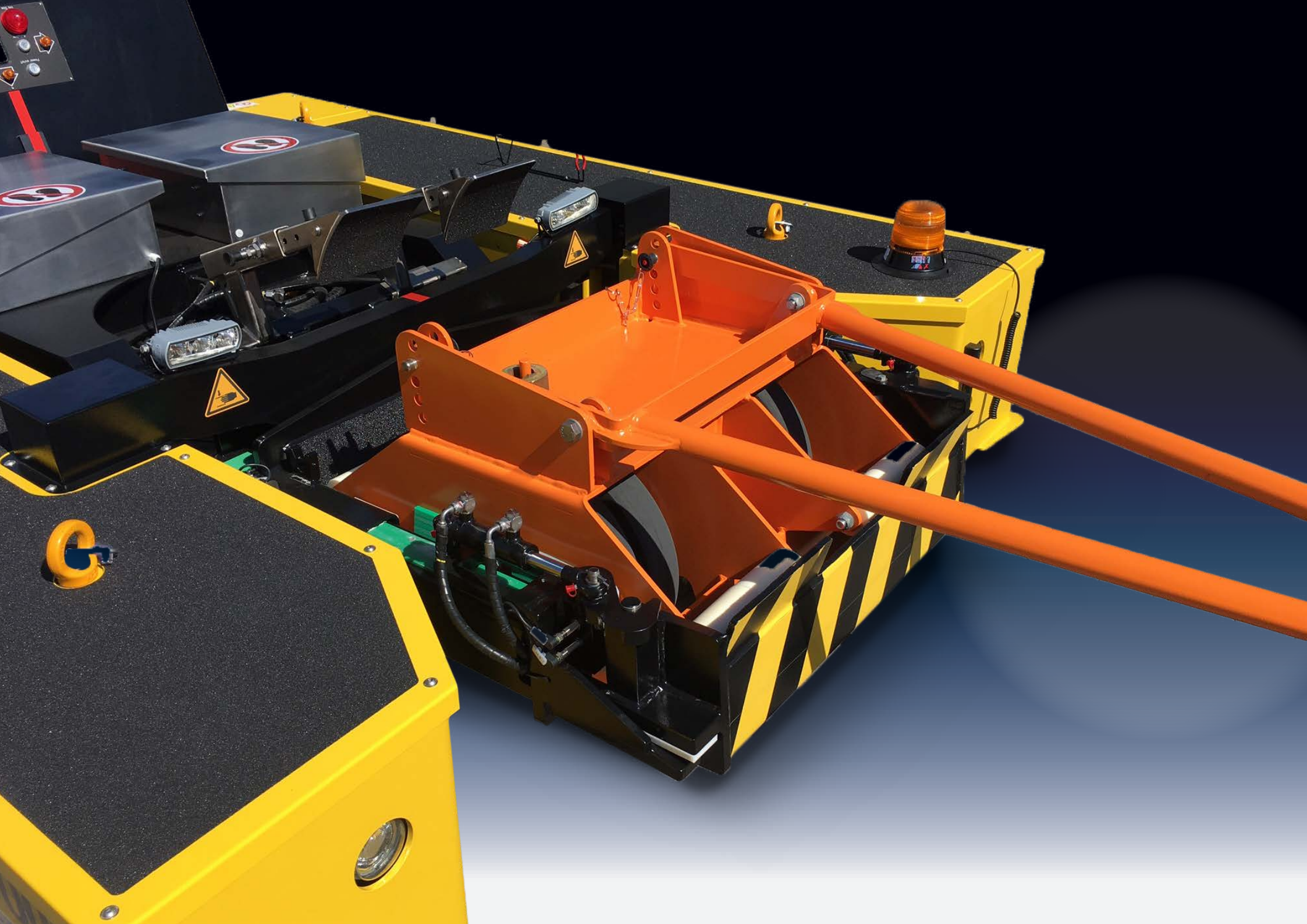
Automatic Counter Steering

I-NPS takes action actively and not only with a simple alarm – when it is too late.

The forces and torques acting on the nosegear are measured by weighing cells. Mototok's Intelligent Oversteer Protection System (I-NPS) prevents too high torques and initiates a counter steer action whilst either pulling or pushing the aircraft.



Auto counter steer operation characteristic whilst pushing the aircraft



For a quick transport to another location at the airport.

With the help of the towing adapter, the Mototok can be towed over a long distance of the airport. The drive wheels are raised and thus do not hinder the towing process.

Video:
www.bit.ly/mototok-tow

The Power of Engineering – Made in Germany

Our innovative aircraft tractors, which are designed for a long service life, are optimally equipped for daily hard use, as they consist of high-quality materials and hand-picked components according to the best technical findings. Our products are able to withstand the toughest conditions under wind and salt water. Thanks to the selection of the best materials, only limited maintenance is required.

Our production process meets and applies to all the necessary requirements and conditions required in mechanical and electrical engineering.

2006/42/EC	Machinery Directive (MD)
2014/35/EU	Low Voltage Directive (LVD)
2014/30/EU	Electromagnetic Compatibility Directive (EMC)
2014/53/EU	Radio Equipment Directive (RED)
EN 1915-1	Aircraft ground support equipment General requirements Part 1: Basic safety requirements
EN 1915-2	Aircraft ground support equipment General requirements Part 2: Stability and strength requirements, calculation and test methods
EN 12312-7	Aircraft ground support equipment Part 7: Aircraft movement equipment
EN ISO 12100	Safety of machinery General principles for design Riskassessment and risk reduction
EN 1175-1	Safety of industrial trucks Electrical requirements Part 1: General requirements for battery powered trucks
EN ISO 4413	Hydraulic fluid power General rules and safety requirements for systems and their components
EN ISO 13849-1	Safety of machinery Safety-related parts of control systems Part 1: General principles for design
EN 60204-1	Safety of machinery – Electrical equipment of machines Part 1: General requirements

(01-2019)

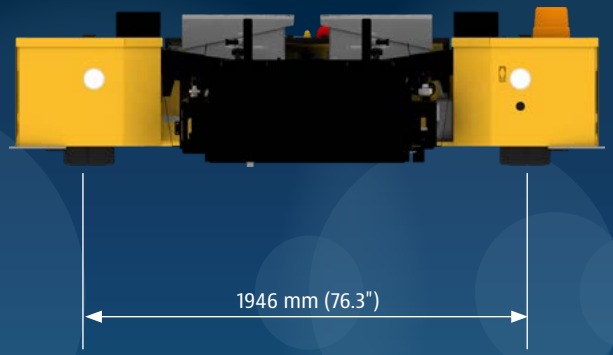
Technical Data

Mototok		SPACER 8600 MA PB
Use for		double nosewheel 
Maximum towing capacity [1]		95 t
		209439 lbs
Maximum nosewheel weight capacity		10000 kg
		22046 lbs
Dimensions (without antenna, grips on the surface)	width	2610 mm
		102.76 inch
	length	3305 mm
		130.12 inch
	height	553 mm
		21.77 inch
Ground clearance		81 mm
		3.19 inch
Max width of the Nosewheel		851 mm
		33.50 inch
Nosewheel diameter		450 –1200 mm
		17.72 – 47.24 inch
Unladen weight		5400 kg
		11905 lbs
Time to load/fix aircraft		10 sec
Speed		5.4 km/h
		1.5 m/sec
		3.36 mph

Batteries (maintenance-free, deep cycle gel batteries)	Armour Plate 300 Ah with electrolyte recirculation
Voltage	80 V
Recharging time	3 h
Range (depending on workload, distance to push/move, engines of the aircraft on/off)	3-4 days of hangar operations up to 30 pushbacks
Possible terrain	Concrete, stone
Tyres	Puncture-proof tyres
Three Way Braking system: 1. Recuperation (recharging the batteries), 2. deceleration by reversing direction, 3. electromagnetic disc brake	
Optional Equipment	
Radio remote control (with safety features, waterproof, certification of conformity), worldwide safety approval, including airports, TÜV certified	inclusive
Fully hands free hydraulic door	inclusive
Hydraulic nosewheel securing [2]	inclusive
Driving light (LED, 10,000 hour operating life, very high beam range)	inclusive
Yellow flashlights on both sides of the machine	inclusive
Safety beeper	inclusive
Automatic controls by ground markings (AGV functionality)	available

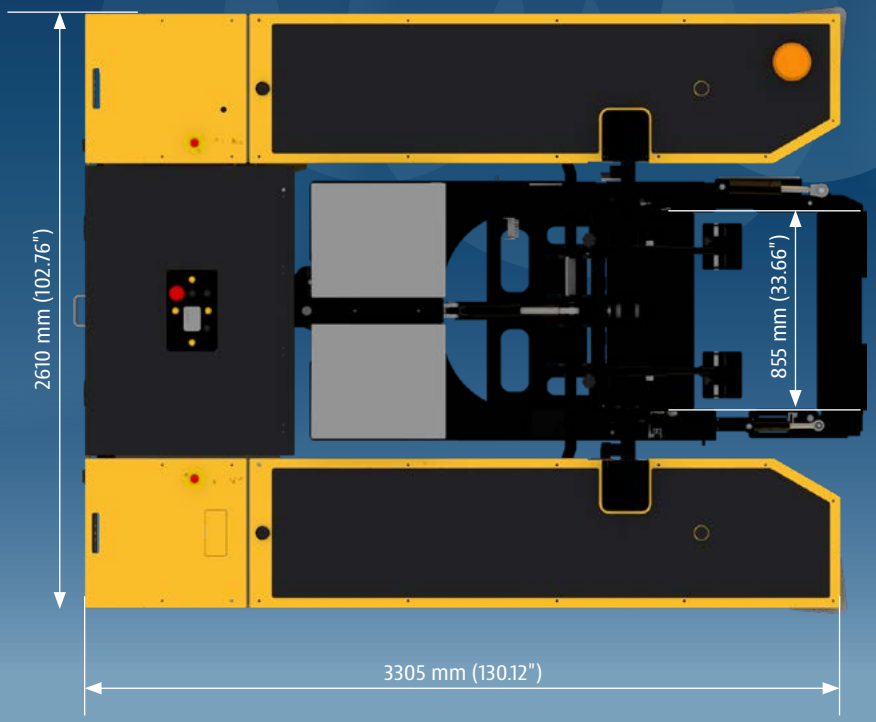
Mistakes and technical alterations reserved / Date 01.2019
1) The stated towing capacity is valid for towing on normal ground conditions without any incline.
2) This prevents the nosewheel from rising and slipping out of position. The securing device is hydraulically lowered onto the nosewheel and securely locked at the push of a button.

Dimensions



Aircraft tires
wheel diameter: 450–1200 mm (17.72"–47.24")
width: max. 851 mm (33.5")

All dimensions without antenna, handgrips, etc.
Subject to change without prior notice




FLUGZEUGSCHLEPPER
Aircraft tugs
TWIN für Flugzeuge
M für Flugzeuge
mototok

Mototok – the company.

- Founded 2003 by Kersten Eckert and Thilo Wiers-Keiser
- Worldwide distribution since 2008 with over 850 machines in use worldwide
- Distribution partners and subsidiaries in USA, China and Singapore
- Developing and manufacturing tugs for Airports · FBOs · MROs · Aircraft manufacturers · Airlines · Offshore · Military and other forces

AIRBUS · BRITISH AIRWAYS · MENZIES AVIATION · SUKHOI AVIATION CORPORATION · BOEING · EMBRAER · PILATUS · Thomson · BOMBARDIER the evolution of mobility · Gulfstream · UAC UNITED AIRCRAFT CORPORATION

Video:
www.bit.ly/mototok-portfolio

Mototok.
Electrify your Ground Handling.

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