

# Introducing



# Universal Mk1

With matrix acquisition system



At INDAL Technologies we believe that our aircraft handling systems are the best available in the world today.

We develop and test our systems at our cost and our corporate risk.

By this unique means we can provide units that are genuinely Commercial Off The Shelf (COTS) solutions. ready to go with minimal end user changes.

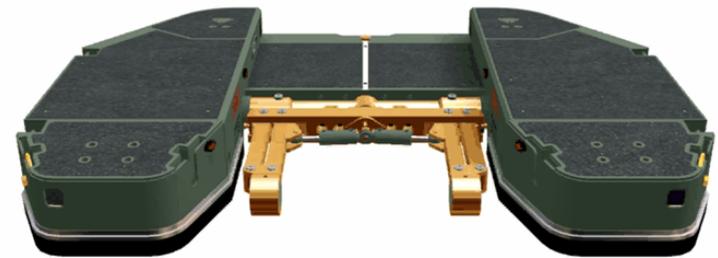
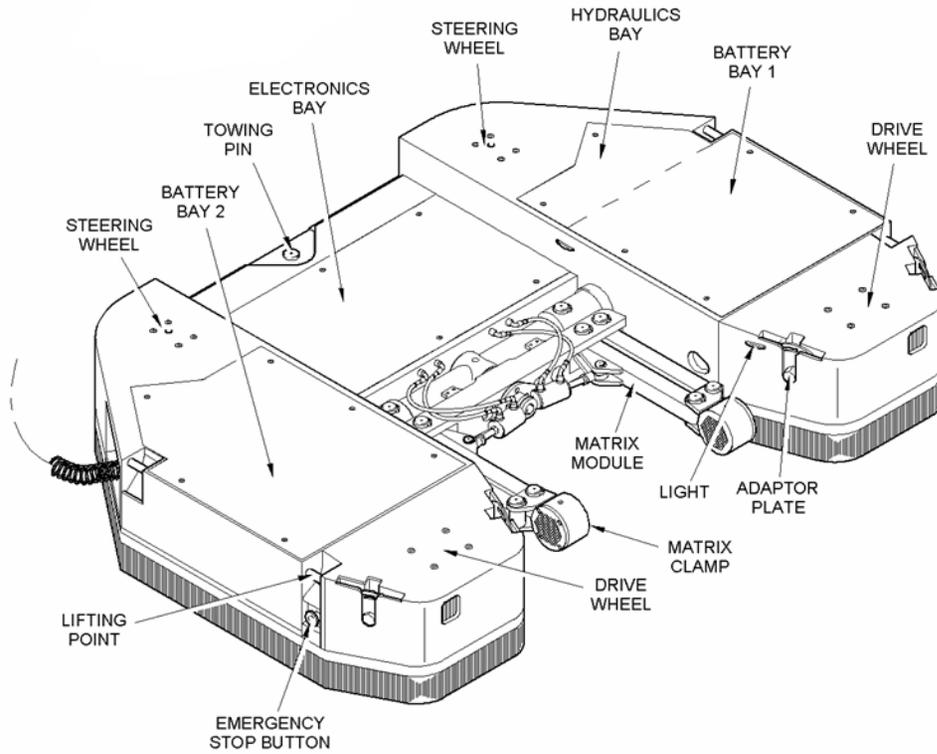
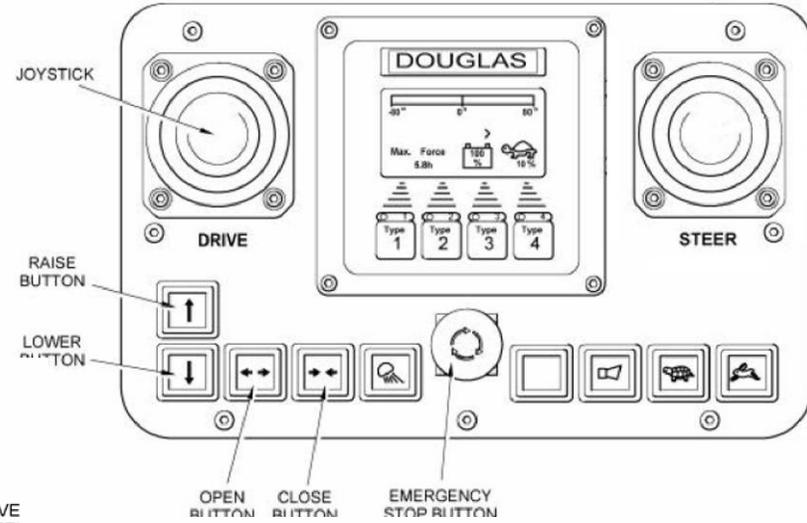
Of course, as the market leading supplier in our niche market we can also produce specially designed products exactly tailored to our clients specific requirements.

INDAL Technologies units such as MANTIS offer absolute cutting edge, digital, computerised control technology that dramatically reduces servicing times and ensures tremendous endurance between battery charges, even at maximum payloads and high sortie rates. At the same time the units utilise the latest material technology to minimise weight and ensure that the aircraft handling GSE 'mass above water line' is always the absolute lowest technically possible.

**The INDAL Technologies is an all electric pedestrian operated vehicle designed for manoeuvring both rotary and fixed wing aircraft.**

*Key Points:*

- Low profile – 350mm [13.8”] in height (only 215mm[8.5”] in the mid section) with 70mm [2.75”] of ground clearance.
- Capable of lifting 3,500 Kgs [7,716 Lbs]
- Capable of towing an aircraft with AUM of 16,000 Kgs [35,274 Lbs].
- Fully configurable to customer requirements. This includes all drive power curves and hydraulic systems.
- Multi aircraft compatibility without the need for aircraft specific adaptors.

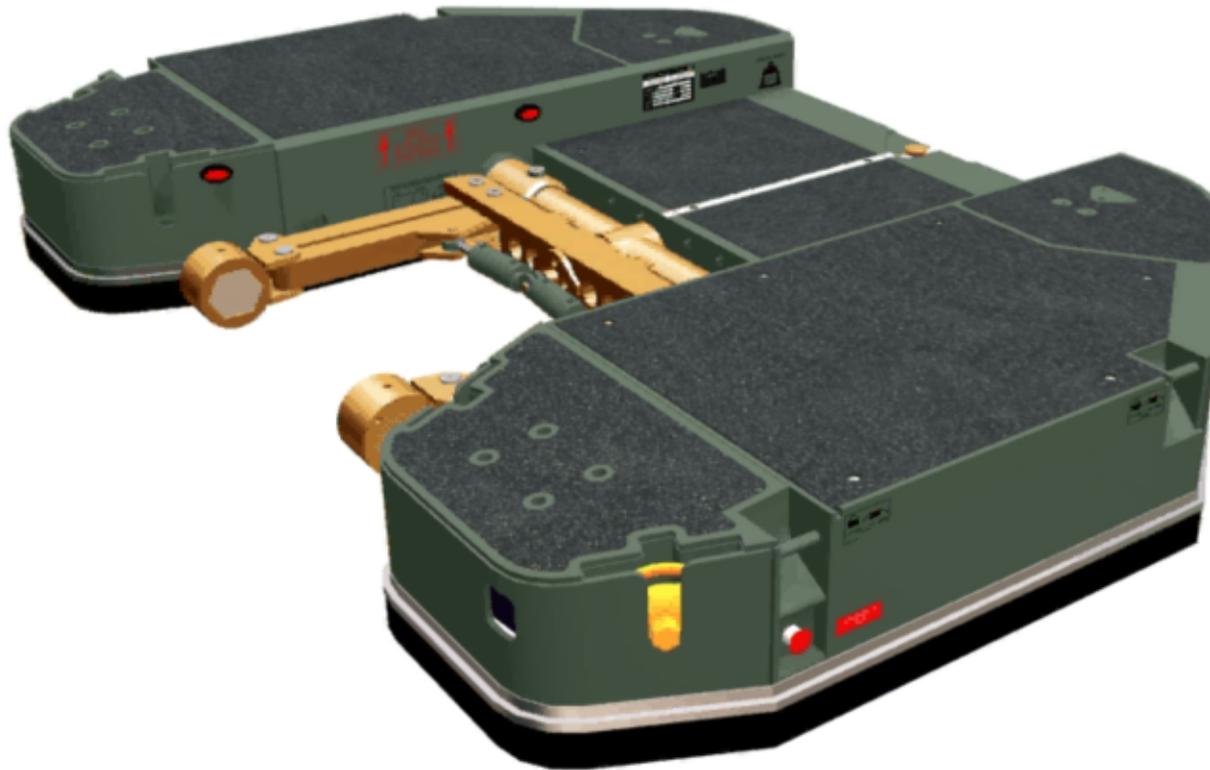


## DIMENSIONS

Length (overall)	70"	[1780 mm]
Width (overall)	100.8"	[2560 mm]
Height (over drive wheels)	13.8"	[350 mm]
Height at centre	8.5"	[215 mm]
Wheelbase	53.6"	[1362 mm]
Wheel track – Steer	55"	[1400 mm]
Wheel track - Drive	67.6"	[1718 mm]
Ground clearance	2.8"	[70 mm]

## PERFORMANCE

Maximum tractive effort	6KN [1350 Lbf]
Maximum tractive effort–Option	14KN [3148 Lbf]
Speed	0 to 5.5 kph [0 to 3.4 mph]
Turning Circle-Drive	2400 mm [116.9"]
Turning Circle-Centre Point	0mm
Duration 7km [4.5 miles] pulling an aircraft of 16,000 kg [35,274 Lbs].	
5 hours continuous movement pulling a 11,000Kgs [24,250 Lbs] aircraft.	



Matrix arms - Fully lowered height – 6” [150mm]  
Fully raised height – 31” [785mm]



Adaptors in stowage locations



Adaptors in clamp area

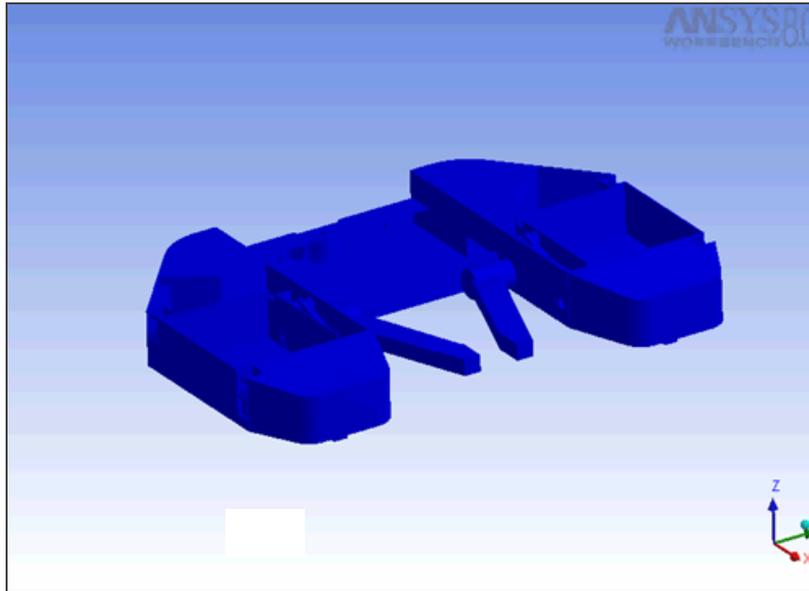


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## Vehicle Features

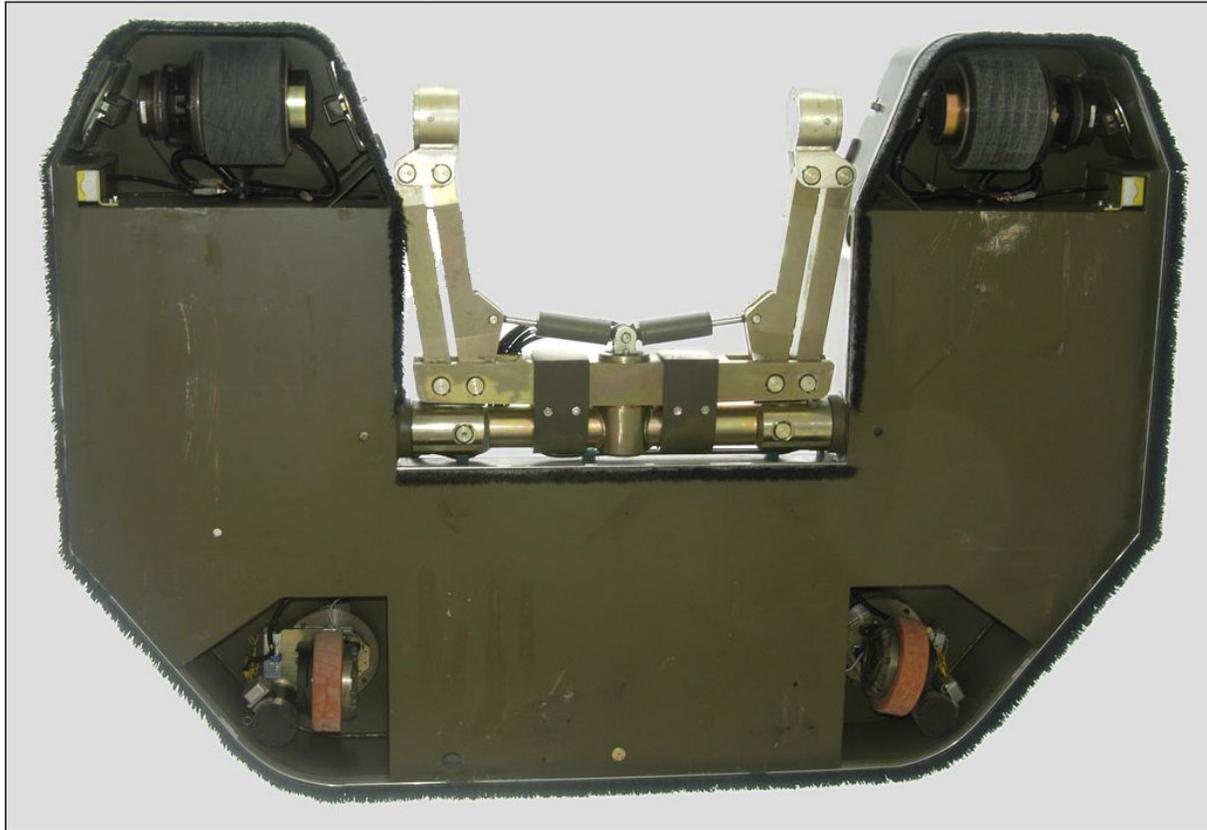
# Chassis



FEA using ANSYS Designspace

## Chassis

- Monocoque chassis made from S275 (43a) mild steel plate. FEA tested.
- Finished in customers choice of colour with Infra Red Reflective paint (IRR).
- Integrated tow attachment, adaptor disk stowage and lift/lashing points.
- Ready for optional extras.



- Flat underside with no obstructions.
- All wheel assemblies housed in a self contained areas for protection.
- Brush strip “skirt” to diffuse water wake to underside.

# Electrical Systems



## Battery Charger

- World wide charging 96V to 264V @ 50-60 Hz
- Intelligent 3 stage charger with boost, constant and trickle charge



## Batteries

- 24off - 2Volt Cells - (210Ah @ 48V)
- Arranged in 12 packs of two
  - with integral lifting eye
- Integrated "Aqua fill" system



## Main Contactor

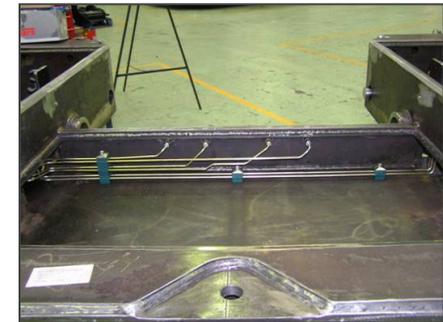
- 4 Position break-then-make switch
  - Prevents different modes being selected at the same time
- Switches – ON / OFF / CHARGE / EBR

## Hydraulics

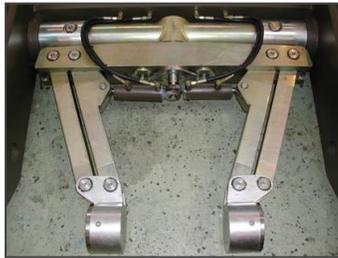
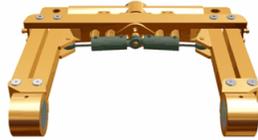


### Hydraulics

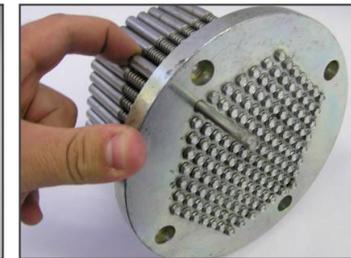
- Fully integrated modular hydraulic pack
- Contains tank, manifolds, valves and on board pressure gauge which can be attached to any test point for hydraulic checks
- Manual release valves for emergencies
- All metal pipe work is stainless steel
- All hydraulic hoses are the same length to minimise stock inventory



## The Matrix



- The key to the matrix is a clamp head consisting of a steel housing into which a cartridge assembly of pins is mounted.
- All 140 pins are individually mounted on springs through a back plate which forms the cartridge assembly.
- In the event of a pin being damaged the cartridge can be removed from the vehicle and repaired. Stock cartridges can be carried to minimise vehicle down time.
- The entire matrix assembly oscillates 7° about the centre to allow for castor angle.



## Operating Procedures

1. The operator identifies the aircraft type to be moved and selects the aircraft type on the remote chest pack console. (This sets the maximum tractive effort within strict parameters laid down by the aircraft manufacturer for the particular aircraft)

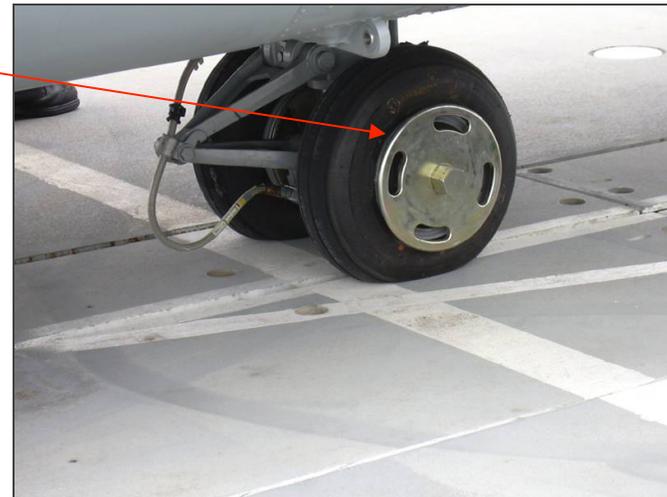
Aircraft Selection Buttons



## Operating Procedures (continued)

2. Select an appropriate set of adaptors from their stowage location on the handler and insert into the towing attachment points on the aircraft.

Towing Adaptor Disk  
18.8mm [0.75"] or  
14.4mm [0.57"] Locating Pin



## Operating Procedures (continued)

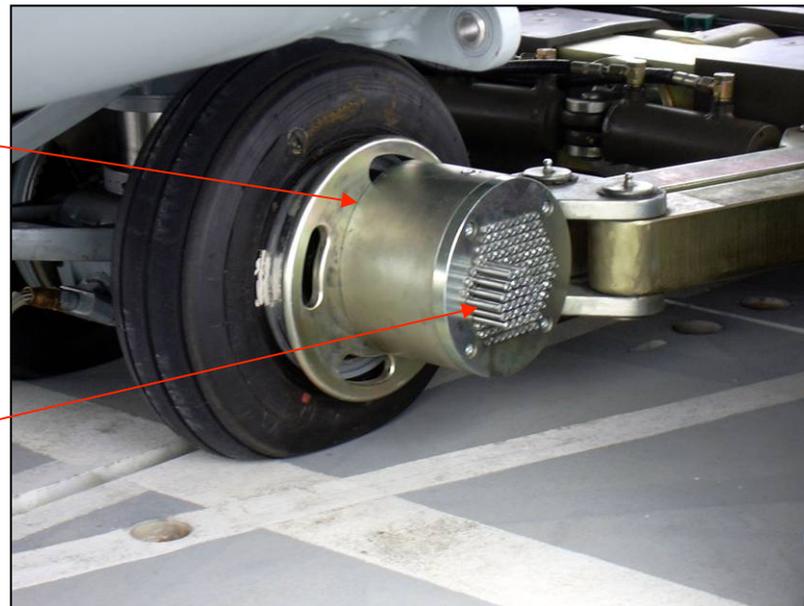
3. Raise or lower the arms to the required height and move the handler to approximately encompass the aircraft nose or tail wheel.



## Operating Procedures (continued)

4. Using the chest pack controls, clamp the arms until they come into contact with the adaptor disks, continue to clamp until the matrix head is in full contact with the disk and the pins deflected.

Matrix head in full  
contact with adaptor  
disk



Matrix pins deflected

## Operating Procedures (continued)

### 5. Towing Operation

Nose wheel weight < 3500 Kg [7,716 Lbs] , Use the chest pack controls to raise the arms until aircraft nose wheel is approximately 50mm clear of the floor.

Aircraft is now ready to be manoeuvred.

Nose wheel weight > 3500 Kg [7,716 Lbs], Use the chest pack controls to raise the arms, the nose wheel weight of the aircraft will be translated into the handler (the aircraft will not be raised) the aircraft will be towed in the same manner as if a tow bar were attached i.e. wheels in contact with the ground.

Aircraft is now ready to be manoeuvred.

NOTE As the lift pressure increases a locking mechanism will automatically prevent the matrix arms from opening.

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## In Service Examples.....



Universal – Handling Lynx Mk8  
Approaching chin dome



Universal – Handling Lynx Mk8  
Matrix connected



Universal – Handling Lynx Mk8  
Radar dome clearance



Universal – Handling Lynx Mk8  
Radar dome clearance



Universal – Handling Lynx Mk8  
Turn with weapons



Universal – Handling Lynx Mk3



Universal – Handling Sea King



Universal – Handling Merlin EH101



Universal – Handling Apache



Universal – Handling Harrier

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## Unique Features

## – Stacking

- In order to maximise deck space two units may be stacked
- Ram may be driven up purpose built ramps or lifted into position



## - Towing Applications



The tow pin adaptor can be utilised for towing trailers, weapon loading trolleys or any tow bar adapted unit



Even in stacked configuration  
Ram can still be used



## – Other Applications

Adaptations can be custom designed for various applications including scissor lifts, fire tenders and engine carriers thus making a truly universal vehicle.

