

# RAPID RUNWAY REPAIR TECHNICAL DATA

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Image 1: Harrier on Bomb Damage Repair Mat

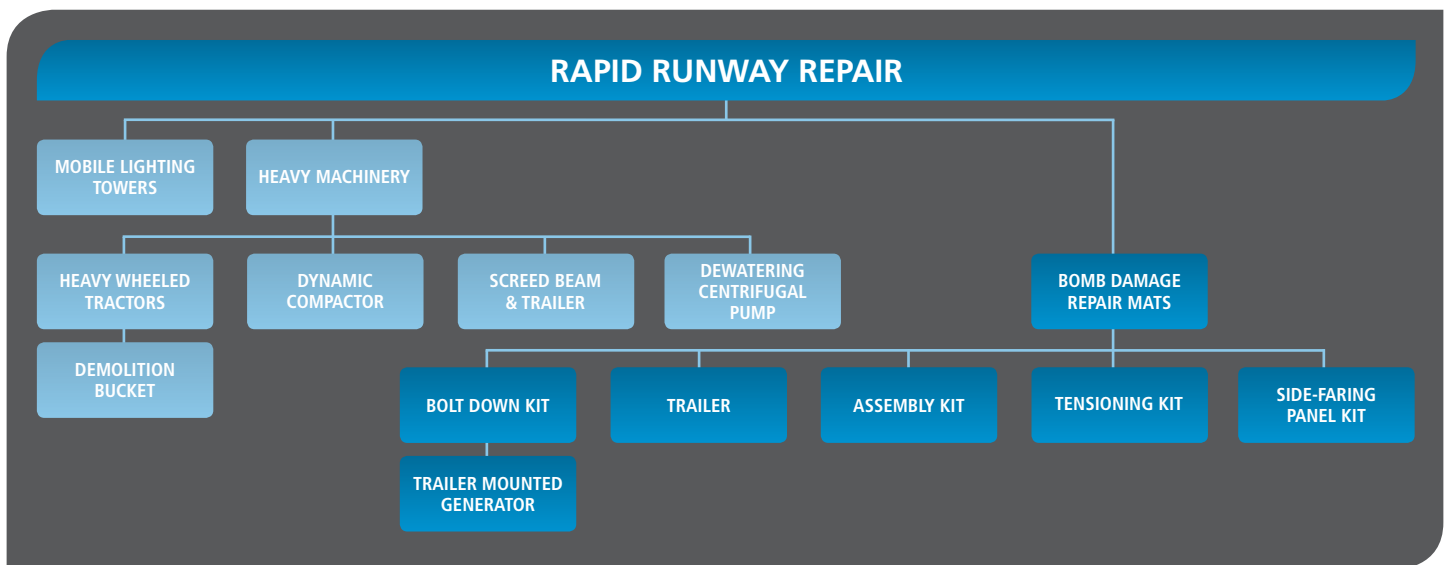


# RAPID RUNWAY REPAIR

## SYSTEM INTEGRATION

Rapid Runway Repair (RRR) is a vital stage in the process of Airfield Damage Repair (ADR). ADR is part of the larger strategic principle of 'Survive to Operate', the objective of which is to keep airfields operational following an enemy attack. An ADR unit requires suitable equipment in order to carry out this function. FAUN is able to supply all the items required for ADR.

The other items required are detailed in appendix 2 in the publication "Survive to Operate: A Guide to Airfield Damage Repair" which is published by FAUN.



## THE PROCESS OF AIRFIELD DAMAGE REPAIR

**This sequence briefly outlines the process of ADR and shows how Rapid Runway Repair fits into the overall strategic process of enabling flying operations after an attack on the airfield.**

1. Reconnaissance – immediately after the attack, the base commander must establish what has damage has occurred and what must be repaired in order to resume flying operations.
2. Repair plan – identify an area that can be used as a 'Minimum Operating Strip' (MOS) for take-off and landing. Identify how many scabs and craters there are in the MOS that will need to be filled and covered with Bomb Damage Repair Mats (BDRM).
3. Explosive Ordnance Disposal (EOD) – detonate, dismantle or rapidly disrupt unexploded bombs.
4. Rapid Runway Repair – conduct crater repair, to include: refilling the crater bowl, reducing the heaved pavement and providing a structural capping to the crater. Lay Bomb Damage Repair Mats over the repaired crater to enable aircraft to taxi, take off and land on the MOS.
5. Restore essential services – ensure that vital services are in place for flying operations to resume.
6. Follow on repairs – begin to repair other less vital areas of the airbase and replenish stocks of crater repair materials and machinery in order to be prepared for further attacks.

## RAPID RUNWAY REPAIR TIMINGS

The table below gives approximate timings for the repair of a medium sized crater.

Stage Activity	Time in Minutes																							
	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115
1 Deploy to site	█																							
2 Set up floodlights		█																						
3 Clear debris		█	█	█	█	█	█	█	█															
4 Cut out heave				█	█	█																		
5 Clean crater				█	█	█	█																	
6 Fill crater							█	█	█	█	█	█	█	█										
7 Level and compact aggregate									█	█	█	█	█	█	█	█	█							
8 Screed surface																	█	█						
9 Lay, tension and bolt down mat																		█	█	█	█	█	█	█
10 Sweep area		█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
11 Scab repair			█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
12 Clear area																								█

Videos of the Rapid Runway Repair process are available here: [www.faustrackway.co.uk](http://www.faustrackway.co.uk)

# BOMB DAMAGE REPAIR MAT

## DESIGN PRINCIPLE

**The principle of the Bomb Damage Repair Mat to create an even surface on which aircraft can land, take off and taxi. Bomb Damage Repair Mats are used to cover craters, caused by enemy fire, which have previously been filled with aggregate.**

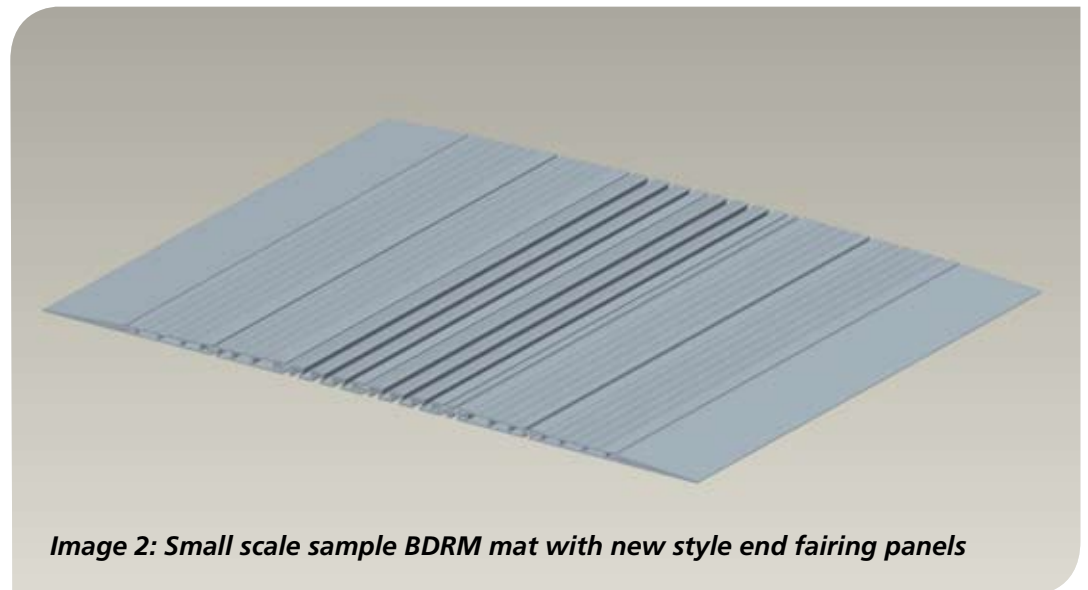
### Operational Principle

Bomb Damage Repair Mats are constructed from full and half length aluminum panels of heavy duty, corrugated design. They are linked together using a sliding joint, and are locked together using quick release shoot bolts. The assembled BDRM rolls up for storage and transportation by specialist trailer. The mats are moved into position using a heavy wheeled tractor and then rolled out by hand.

BDRM panels are connected using a 'tongue and groove' method, forming an articulated joint. This enables the BDRM to be laid on undulating ground. BDRM provides a safe, stable, temporary take off and landing area for aircraft, without causing damage to the ground surface.

A standard mat (22m x 16m) contains 104 rows of panels; each containing three full length panels and one half panel, which are assembled in a brickwork pattern. BDRM is designed to be split by hand into smaller patches if required.

Fairing panels are attached to the ends and sides of the mat to ensure aircraft mount and dismount smoothly.



*Image 2: Small scale sample BDRM mat with new style end fairing panels*

### LOAD CLASSIFICATION

BDRM are cleared for aircraft categorized as:

- Load Classification Number 45
- Load Classification Group IV

## WEIGHT AND DIMENSIONS

<b>Standard mat dimension</b>	22m x 16m
<b>Thickness</b>	31mm
<b>Diameter (when rolled)</b>	1.2m
<b>Weight</b>	12500Kg
<b>Panel dimensions – full</b>	4.6m x 0.21m
<b>Panel dimensions – half</b>	2.3m x 0.21m
<b>Colour</b>	Powder coated or anodised to reduce glare Grey finish Increased corrosion resistance

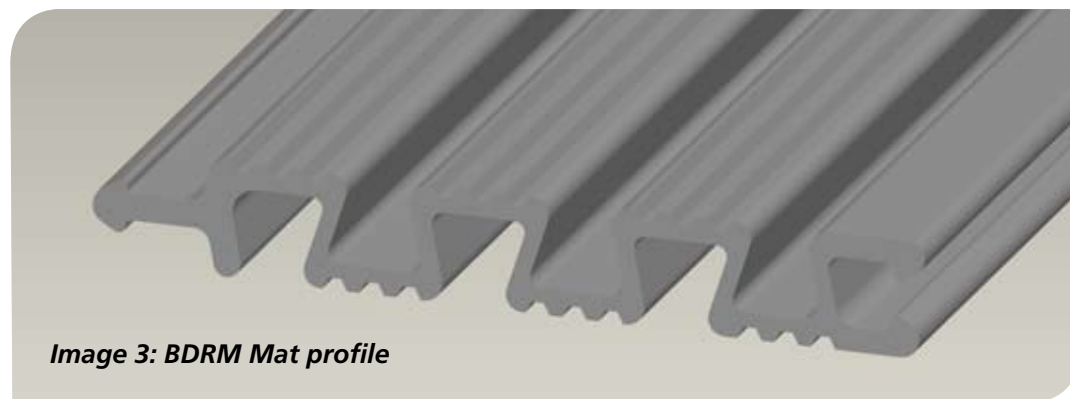


Image 3: BDRM Mat profile

## COMPONENT PARTS

The components listed below are sufficient to make up one 22m x 16m BDRM or two 11m x 16m Bomb Damage Repair Patches (BDRP).

Item	Description	Total Qty supplied	Qty per BDRM	Qty per BDRP
1	Full panel, complete with shoot bolts	312	312	156
2	Half panel, complete with shoot bolts	104	104	52
3	End fairing panel, male long	6	6	3
4	End fairing panel, male short	2	2	1
5	End fairing panel, female long	6	6	3
6	End fairing panel, female short	2	2	1
7	Anchorage bolt hex head M10 x 190mm c/w shields, spacers and washers	112	112	56
8	Anchorage bolt hex head M10 x 102mm c/w shields, spacers and washers	112	112	56
9	Anchorage screws hex head	112	112	56
10	Transit straps	4	4	2
11	Mat support stands	4	4	2

There are two types of end fairing panels available. The standard end fairing panel or the longer end fairing panel suitable for Eurofighter aircraft. Please state your preference upon order.

### ANCHORAGES

2 sets of each type of anchorage bolts / screws are supplied with BDRM. The table below indicates which type of anchorage should be used.

<b>Anchorage bolt – Item 7</b>	Concrete pavements that have a top dressing of asphalt
<b>Anchorage bolt – Item 8</b>	Standard concrete pavement bolt
<b>Anchorage screw – Item 9</b>	For use in full depth asphalt pavements

### SIDE FAIRING KIT

Item	Description	Total Qty supplied
1	Side fairing long	8
2	Side fairing long L/H	2
3	Side fairing long R/H	2
4	Side fairing short L/H	4
5	Side fairing short R/H	4
6	Anchorage 190mm	144
7	Anchorage 102mm	144
8	Anchorage screw	144

### ASSEMBLY KIT

The following hand tools are used to assemble a BDRM. The tools are also used to split a BDRM into two BDRPs.

Item	Description	Total Qty supplied
1	Eye hook	2
2	Fibre rope assembly single leg	2
3	Panel handling tool	2

## TENSIONING KIT

The following equipment is supplied to aid the unrolling, re-rolling and tensioning of the BDRM at the crater site.

Item	Description	Quantity	Application
1	Hook assembly	1	Fits to bucket of HWT for lifting mat
2	Sling single leg	1	Lifting sling for mat when using HWT and hook assembly
3	Adapter towing	4	Engage in fairing panel slots to enable tensioning of the mat
4	Shackle large 3.82 tonne	4	Connects slings to towing adaptor or rolling catch
5	Shackle large 8.64 tonne	6	Connects lifting sling to hook assembly
6	Sling multiple leg	2	Connects towing adapter to tensioning vehicle
7	Shackle keys	4	Hand tool for shackle pins
8	Rolling catch	4	Unrolling aid for mat
9	Chain assembly	4	Connects rolling catch to towing vehicle
10	Lifting handles	4	Locate into fairing panels slots to aid the rolling up of the mat
11	Wheel chocks	4	Prevents mat from unrolling
12	Dunnage blocks	4	Temporary support for mat to enable removal of transit straps prior to unrolling

## BOLT DOWN KIT

The following equipment is supplied to secure the mat (and side fairing panels when required) to the pavement area. An electric power supply is required, which is normally a generator trailer (see separate data sheet).

Item	Description	Quantity	Application
1	Hammer drill	6	Electric hammer drill
2	Masonry drill bit 18mm	72	Drill for anchorage bolt
3	Masonry drill bit 13mm	12	Drill for anchorage screw
4	4 socket cable reel 25m	3	Connect hammer drill to generator
5	17mm x 12mm drive socket spanner	6	Tightens anchorage bolt / screw
6	Socket extension 7"	6	Tightens anchorage bolt / screw
7	Socket spanner handle	6	Tightens anchorage bolt / screw
8	Drill guide bush	10	Drill guide for 13mm masonry drill

**ACCESSORY KIT**

<b>Item</b>	<b>Description</b>	<b>Quantity</b>
1	Shovels round mouth	3
2	Shovels square mouth	9
3	Brooms c/w handles	12
4	Crow bars 4" large	2
5	Hammers sledge 7lb	2
6	Spare handles	4
7	Mash hammers 2lb	2
8	Bricklayers lines	1
9	Waterproof wax marking crayons	6
10	Cowley level and target staff	1
11	Industrial gloves	14
12	Safety helmets	15
13	Industrial eye shields	3
14	Fluorescent safety jackets	2
15	Lifting handles	4



## GENERATOR WITH TRAILER

A diesel powered generator is used to operate the hammer drills provided in the BDRM bolt down kit.



*Image 4: Generator with Trailer*

### GENERATOR WITH TRAILER TECHNICAL DATA

<b>Model</b>	Super silenced canopied diesel generator 1500rpm water cooled
<b>Rated output</b>	10.0kVA (8.0kW)
<b>Phase</b>	Single phase/three phase
<b>Engine</b>	FOCS 1404/Kubota
<b>Alternator</b>	MeccAlte
<b>Fuel tank capacity</b>	58
<b>Run time</b>	95
<b>Canopy dimensions</b>	Length: 1620mm Width: 796mm Height: 1131mm
<b>Weight</b>	400kg
<b>Trailer</b>	2 wheel MoT road tow ,braked and with parking brake lights

Note: This generator will also power the lighting towers required, to provide commonality in spare parts.

## BOMB DAMAGE REPAIR MAT TRAILER

The BDRM trailer is a self loading unit, which is used to move the BDRM from its storage position to the crater site.

The trailer has a hand start diesel engine close coupled to a hydraulic pump. This provides hydraulic power to operate the side mounted support legs and the pair of lifting bolster arms.

Hand operated hydraulic valves provide individual operation of the support legs and the two bolster arms. In addition an electrical wander lead enables the operator to hydraulically steer the rear bogie to accurately align the trailer alongside the mat prior to loading.



*Image 5 and 6: Bomb Damage Repair Mat with Trailer*



<b>General</b>	A two axle drawbar trailer specifically designed for the carriage, loading and unloading of BDRM Masonry drill bit 18mm
<b>Coupling</b>	76mm diameter NATO coupling 4 socket cable reel 25m
<b>Main Brakes</b>	311mm x 178 'S' type cam drum brakes operated by air and with anti lock facility Socket extension 7"
<b>Parking Brake</b>	Multi stroke ratchet handbrake operating on the rear axle Drill guide bush
<b>Wheels &amp; Tyres</b>	B6.5 x 20 ten stud fixing with 8.25 x 20 tyres Optional: Foam filled tyres
<b>Front Bogie</b>	Turntable steered front axle, mounted on 2 spring 7 leaf suspension, connected to a 1.83m 'A' frame drawbar
<b>Rear Bogie</b>	Fixed beam axle on 2 spring 7-leaf suspension Manual release of "straight-ahead" locking pins enables rear bogie to be hydraulically steered for fine adjustment of trailer position to stored BDRM
<b>Jack Legs</b>	Two hydraulically operated retractable side mounted steady jacks
<b>Bolsters</b>	Two hydraulically operated bolster arms to load and unload BDRM Bolster arms non-operational without jack legs deployed Supplied with webbing lifting straps
<b>Chassis</b>	13.53m long single spine construction Centre joint in spine to reduce overall length for shipping Fitted with side mounted power pack and accessory stowage locker
<b>Hydraulics</b>	Hand start diesel engine power pack designed for fully independent controls for operation of steady jacks, bolster lifting arms and rear bogie steering Emergency handpump fitted
<b>Lighting</b>	Wiring to NATO standard
<b>Dimensions</b>	Length = 14.5m Width = 2.5m Height = 2.28m Height when loaded = 3.1m
<b>Weight</b>	Unladen = 8,500 kg Laden = 21,000 kg

## OTHER USES

BDRM can also be deployed to meet the following additional requirements:

- Helicopter Landing Pads
- Hard standings for aircraft on soft ground
- Temporarily taxiways
- Recovery of aircraft that have overrun the airfield

## MAINTENANCE

When stored in a rolled condition, BDRM remains maintenance free for long periods of time. When laid over a crater, BDRM will require regular inspection.

Some settlement of the compacted fill may occur from prolonged aircraft trafficking, leaving localized void spaces under the mat. It may therefore be necessary to roll back the mat to allow top up of the fill material.

When the opportunity exists to carry out a permanent repair to the runway, the mat is rolled up and returned to its storage site to be reused in the event of further attacks to the airbase. Palletised spares kits are available for worldwide deployment.

## TRAINING

To meet the speed and standard of pavement repair required in counter air battle, a high level of training is essential. Training must cover individual skills in the use of the equipment and material, team training for operators and NCOs and integrated training for command elements within the air base post attack recovery plan.

FAUN are able to offer this training by acknowledged experts as part of an overall supply package. Additionally FAUN are ready to assist in assessing the RRR operational requirement, framing concepts of operations and drafting Standard Operating Procedures (SOPs), tailored to meet customers individual circumstances.

## DOCUMENTATION

BDRM is supplied with the following documentation in English as standard. Translation into local language, and/or alternative formats can be provided upon request.

- Operator manual
- Technical and maintenance manual
- Illustrated parts catalogue

