



**Make the difference.**

Telehandlers

## MODEL DESIGNATION



**5** = 500 SERIES - MODEL DESIGNATION

**41** = 4100 KG - MAXIMUM LIFT CAPACITY

**70** = 7.0 Meters - MAXIMUM LIFT HEIGHT

NB: This does not mean 4100kg at 7 meters

# 2,3 and 4 stage booms

2 stage



3 Stage



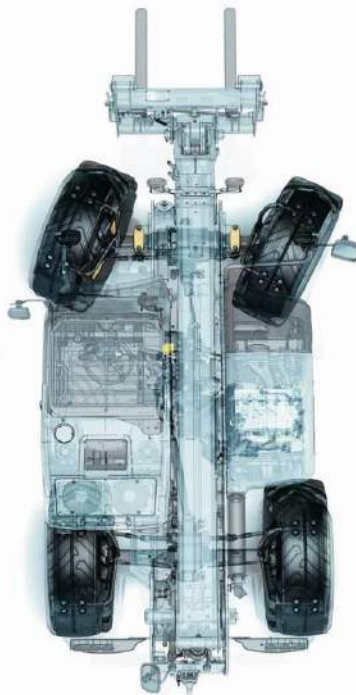
4 stage



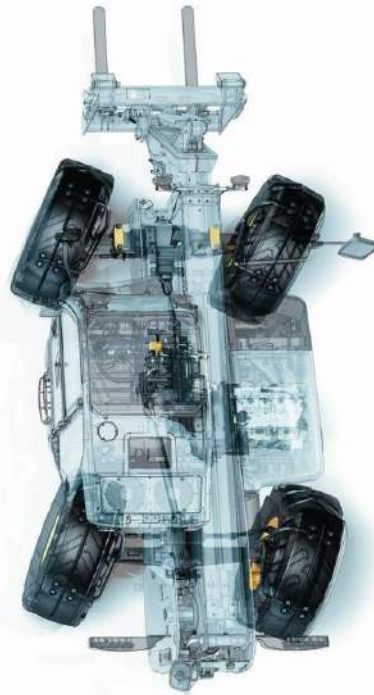
## Steer modes



4WS



2WS



CRAB

## Stability



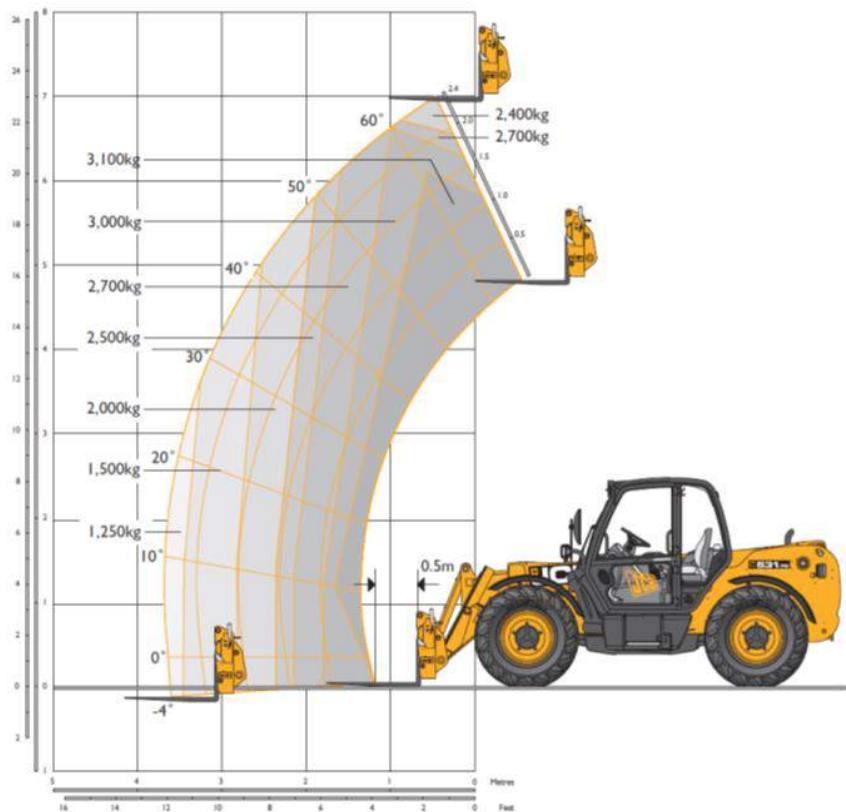
In cab inclinometer to allow the operator to decide if the machine



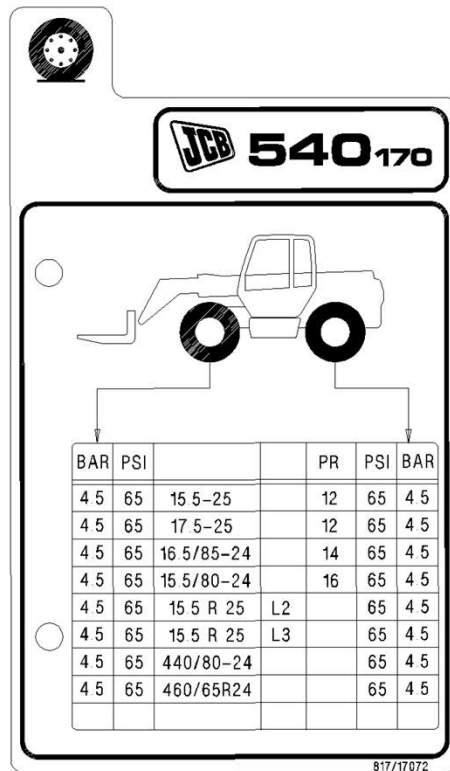
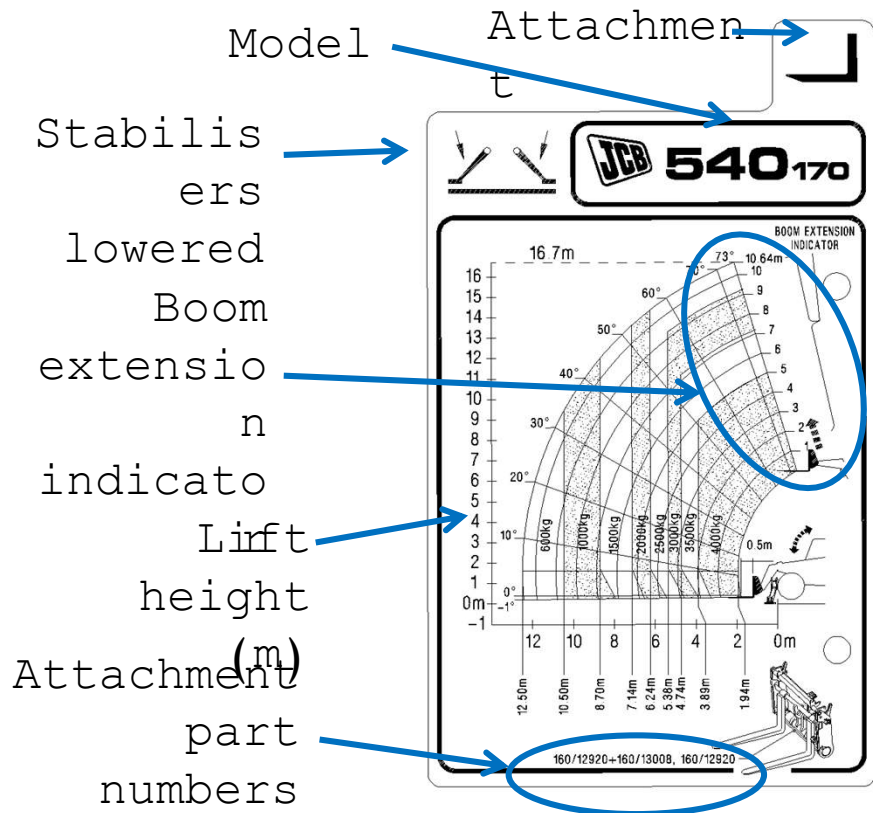
- Clear view roof screen provides the operators with unrivalled vision of the load at height giving safer operation



## Load charts (531-70)



- The load chart shows how the machine capacity de-rates as the load is extended forwards and lifted
- Individual load charts are supplied showing different options and attachments to match machine specification



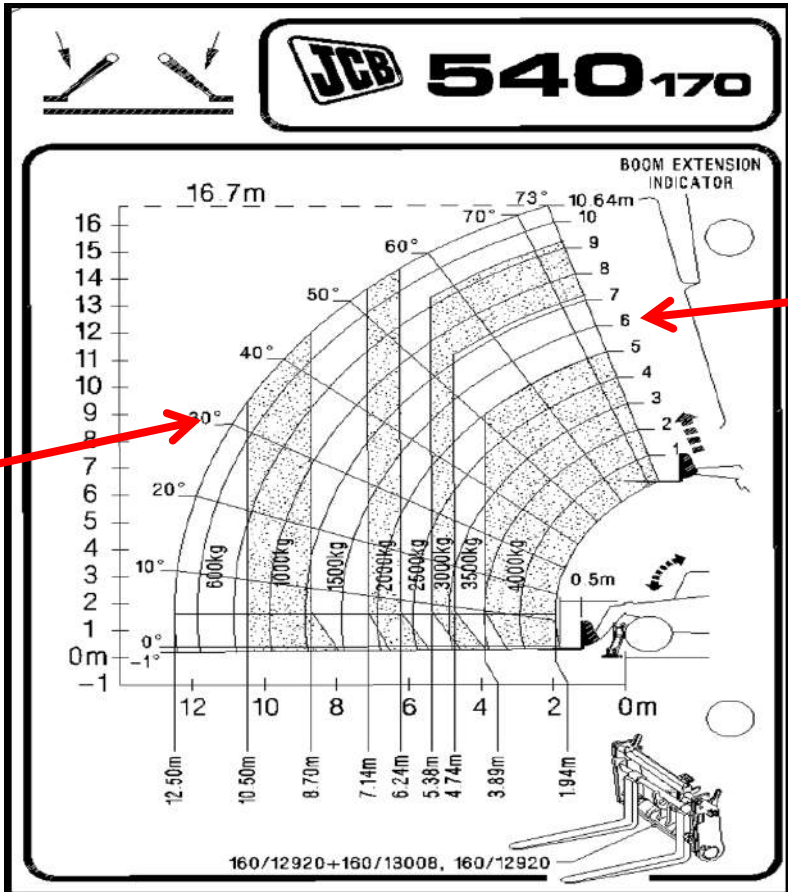
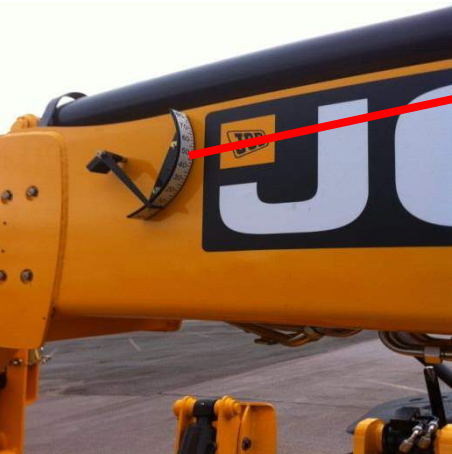
Tyre options and recommended inflation pressures





# Load Charts

Make the difference.



## Factors effecting stability

- Machine; model / size, specification
- Tyre option; brand, radial vs cross ply, tyre pressure, condition
- Attachment; carriage, forks, bucket, jib etc.
- Load centres; 500mm or 600mm
- Stabilisers fitted or not
- Ground conditions; terrain, gradient, surface
- Fixed or suspended loads
- Travel and working speeds
- Lifting plan and risk assessment
- Operator experience

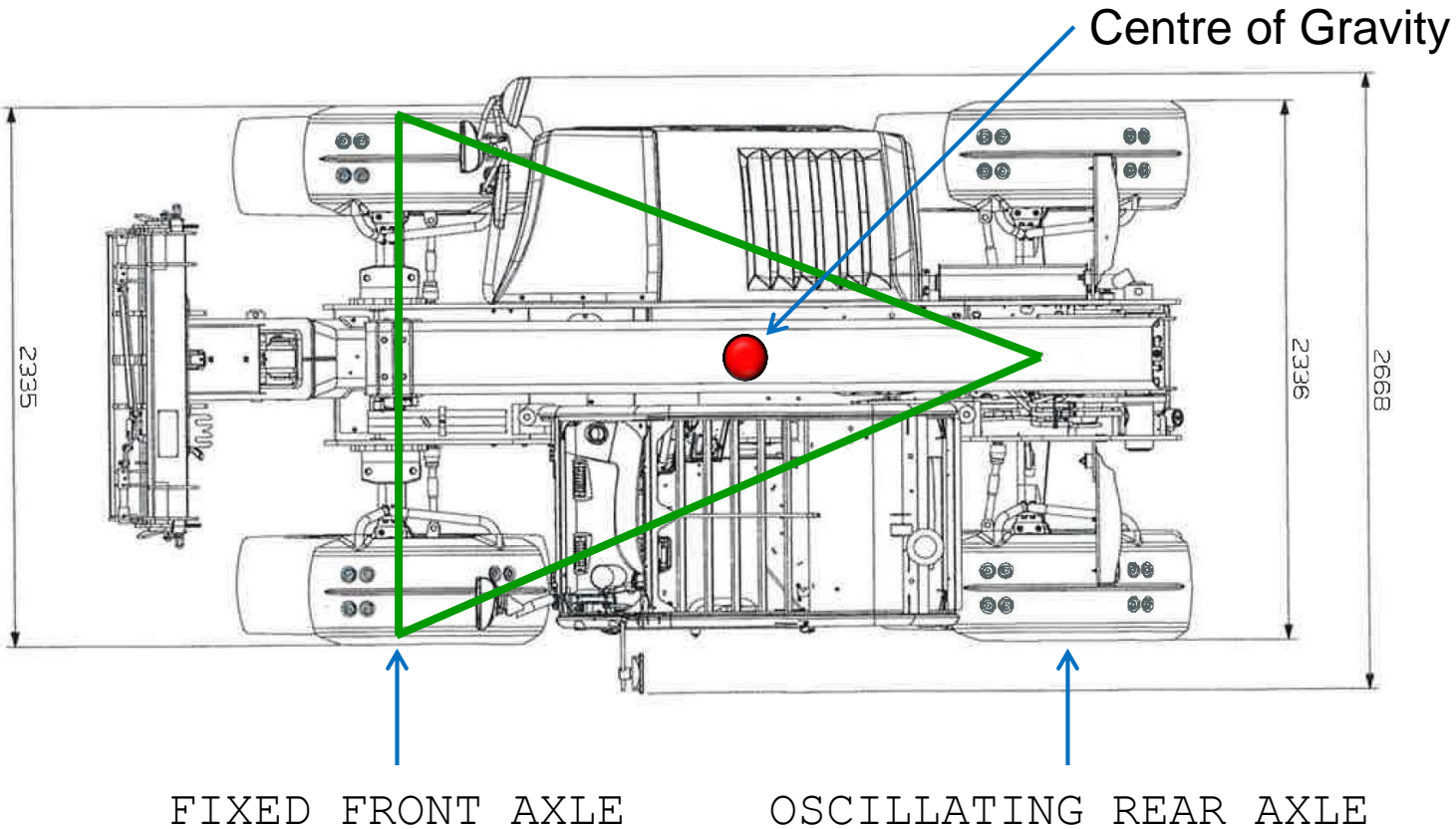
## Stability Explanation

- Telehandlers have a fixed front axle, whilst the rear axle oscillates to maintain ground contact over rough terrain
- For machines with stabilisers the stability triangle extends forwards to the ground contact of the feet (which allows more payload forwards)
- The machine remains stable as long as the centre of gravity remains within the triangle
- As a result it is vital that all lifts are planned and an appropriate Risk Assessment created. "To fail to plan is to plan to fail!!!!!"

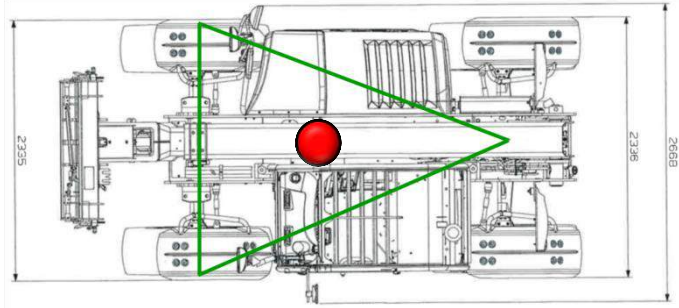


# The stability triangle

Make the difference.

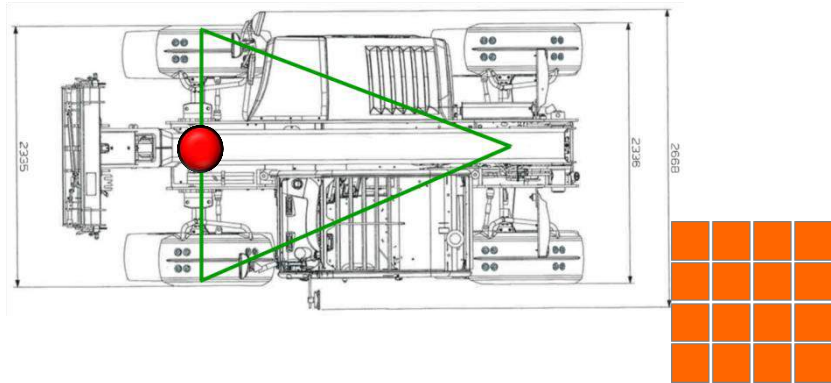


## Forward stability



- When a load is picked up the centre of gravity moves forwards

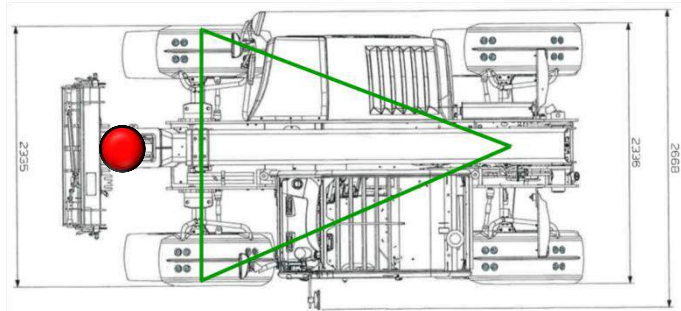
## Forward stability



- If the load is extended forwards the centre of gravity also moves forwards
- The machine remains stable whilst the centre of gravity remains behind the front axle (within the triangle)



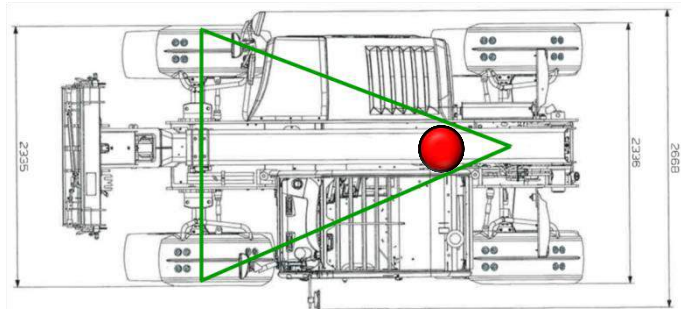
## Forward stability



- After this point the rear wheels will start to lift off the ground
- In normal operations this is prevented by the 'Adaptive Load Control' system\*

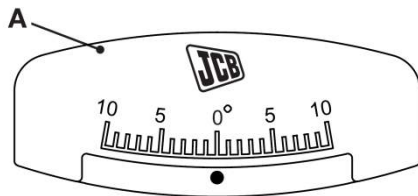
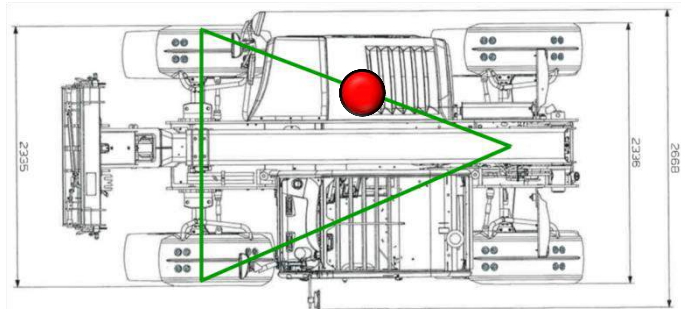
\* JCB patented system to enable compliance with safety

## Backward stability



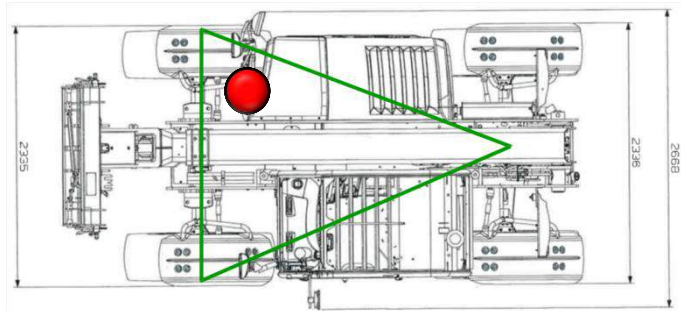
- For a machine on level ground, without load **WITH THE BOOM FULLY RAISED** the centre of gravity moves backwards
- The machine remains stable as long as the centre of gravity remains within the triangle
- Adding load pulls the centre of gravity forwards.

## Lateral stability



- On uneven ground, across a slope the centre of gravity moves sideways
- Stabilisers and/or sway control can be used to level machine and increase sideways stability
- The operator uses the gauge (A) inside the cab roof to determine a level working position

## Lateral stability



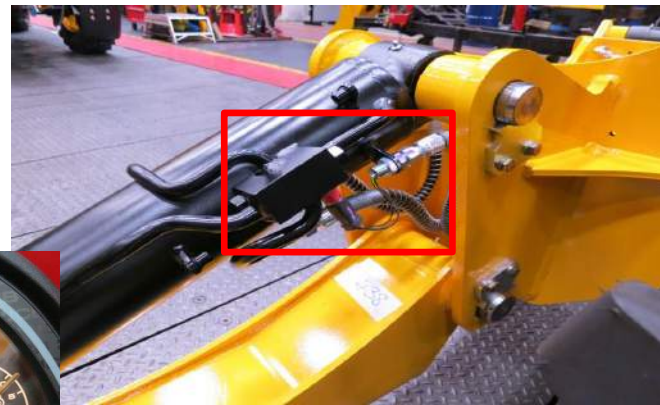
- Naturally most operators are cautious when using high lift telehandlers
- They are usually more careful when lifting load to height (up to 2.5T to 16.7m)
- If the machine is not on level ground the lateral stability is reduced, when the load is removed the

## JCB Safety By Design—Sensors.

- Stabiliser leg ram pressure sensors.
- Boom back (fully retracted) sensor.
- Boom angle sensor at  $45^{\circ}$ .
- Boom angle sensor at  $57^{\circ}$ .
- Rear axle load transducer.

# Stabiliser leg ram pressure sensors

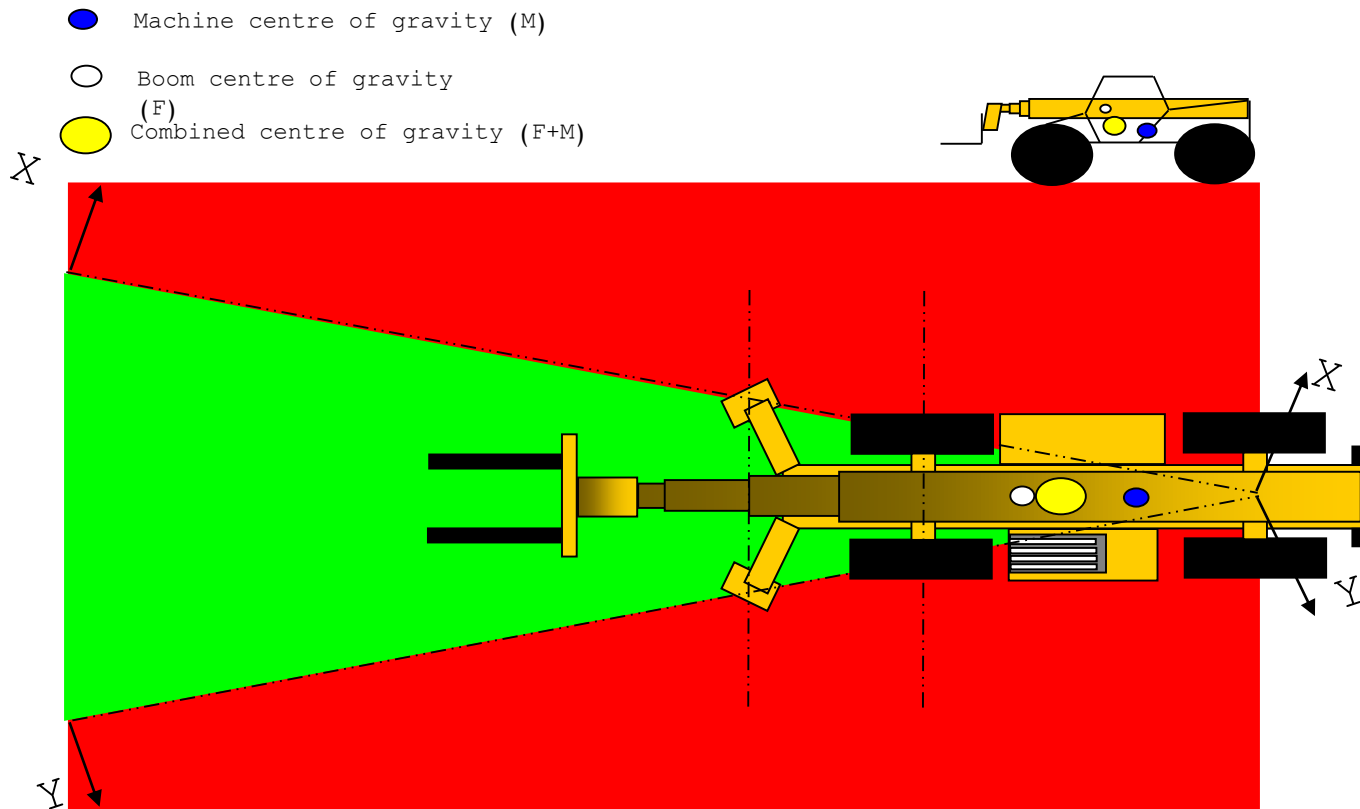
- The pressure sensor ensures that the stabiliser are supporting the machine - indicated on the display.
- This allows the operator to extend the inner boom.



- *Why?*
- If all boom sections are extended horizontally without the stabilisers deployed the machine exceeds the



# Stabiliser Interlock – Inner Boom



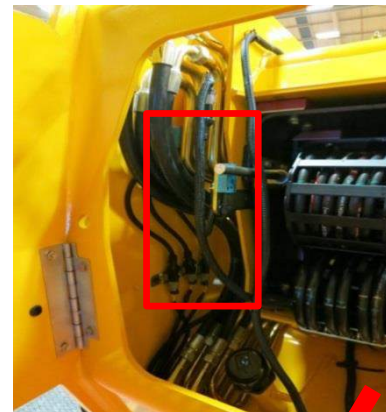
# Boom fully retracted sensor

- Senses that the inner boom is retracted.
- *Why?*
- To prevent the stabilisers being operated when the machine may be in an unstable configuration if the boom is extended.

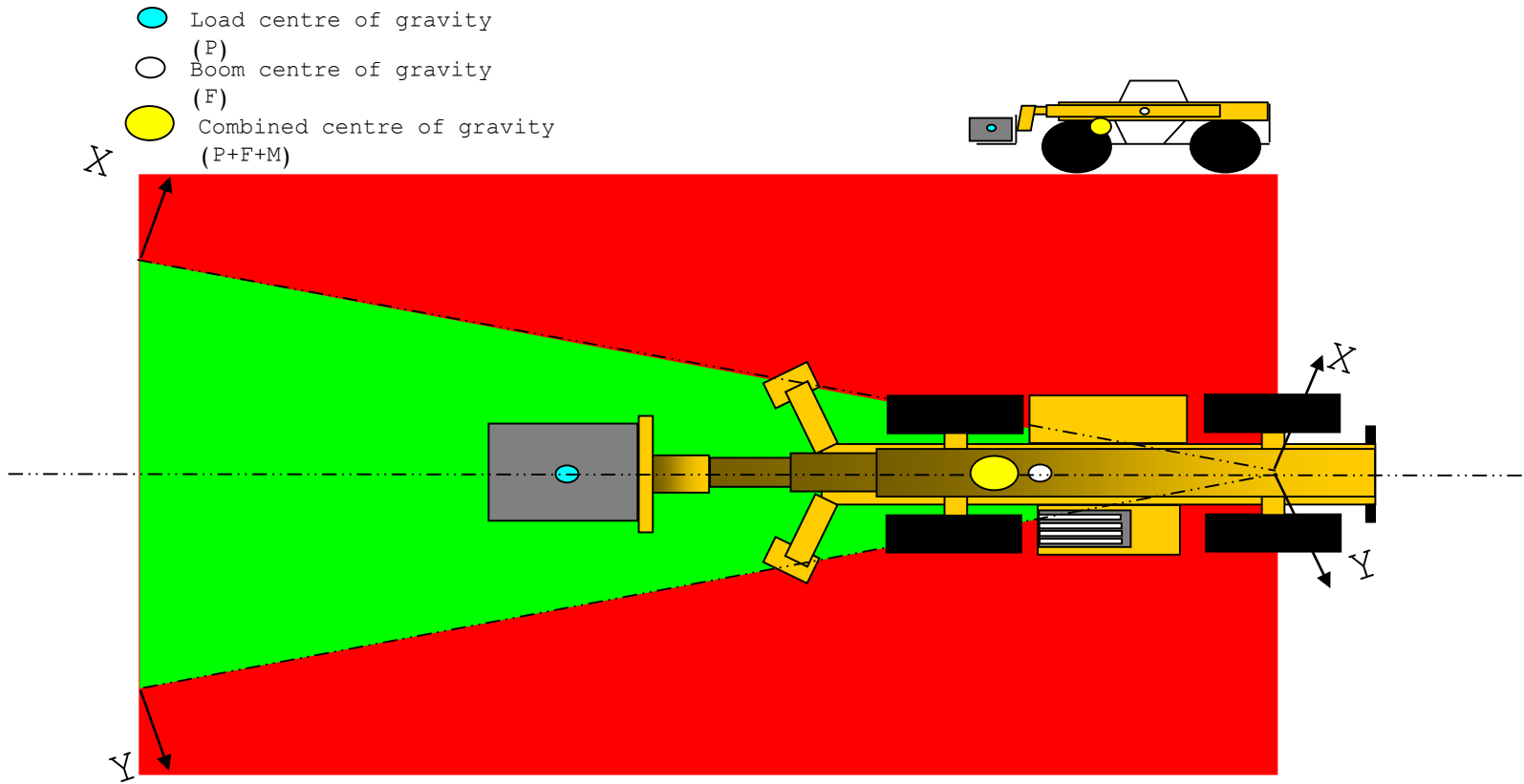


## Boom angle sensor @ 45°

- Required to disable stabiliser operation completely above 45° boom angle.
- *Why?*
- As the boom angle increases the machine stability becomes limited by lateral stability rather than longitudinal stability.
- Disabling operation of the stabilisers prevents the machine being tipped sideways if the legs are operated



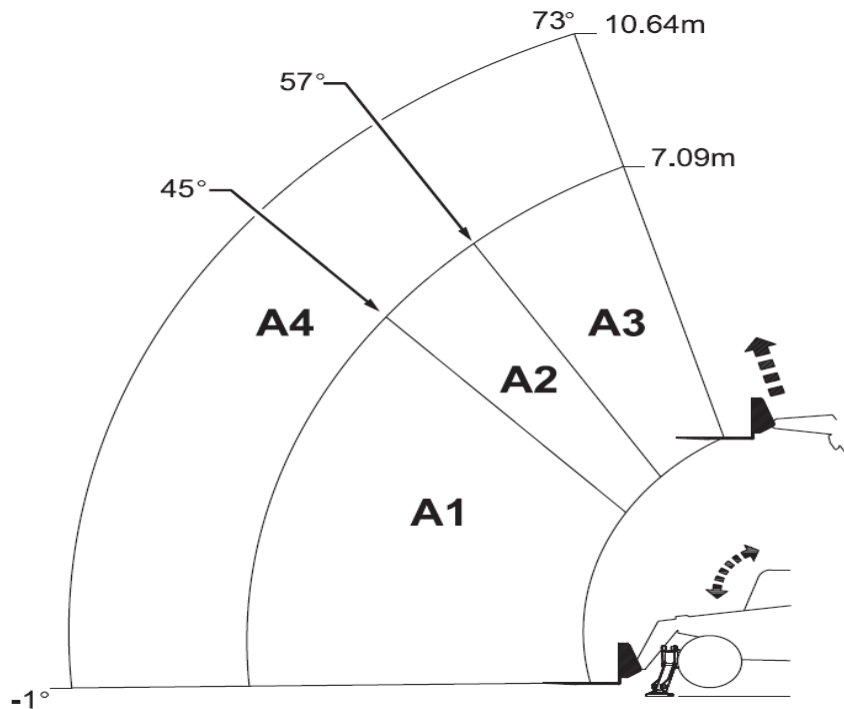
# Boom Angle Interlock



## Boom angle sensor @ 57°

- Required to disable boom lift operation completely above 57° boom angle when the stabilisers are not deployed.
- *Why?*
- At high boom angles the machine stability becomes limited by the lateral stability.
- This boom angle interlock prevents the machine being operated in this zone unless the stabilisers are supporting the machine.

# Operating Envelope Interlocks



**Fig 213. Machines with 4-Stage Boom**

T049840-2

- Boom in zone A1 - Stabilizer legs can be operated.
- Boom in zone A2 - Stabilizer leg operation disabled
- To move the boom to zones A2, A3 & A4 the stabilizer legs must be down and taking load before you exit zone A1 & the stabilizer operation is disabled.
- The stabilizer legs can only be operated when the boom is lowered out of zone A2 A3 & A4.
- When zone A4 is entered you can not raise the stabiliser legs unless all the boom sections



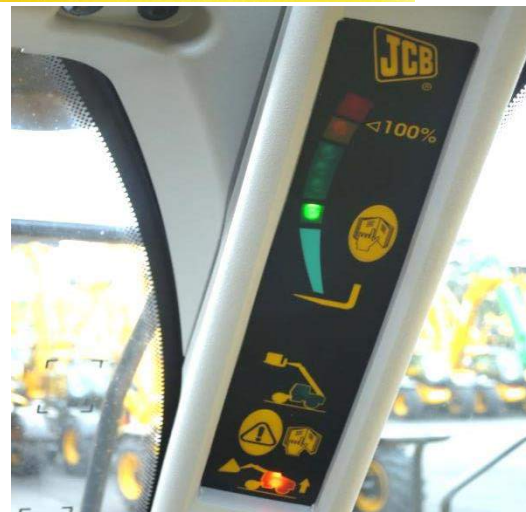
# Adaptive Load Control

- The JCB Adaptive Load Control comprises two elements
  - LLMI (Longitudinal Load Moment Indicator)
  - LLMC (Longitudinal Load Moment Control)

## LLMI – Longitudinal Load Moment Indicator

- LLMI systems on Telescopic Handlers are designed to monitor longitudinal stability – they do not detect for lateral stability
- LLMI's only work under static conditions (i.e. machine stationary) they are not designed to and cannot give accurate load indication whilst the machine is travelling.

- The LLMI consists of a transducer that is mounted on the rear axle coupled to a display in the cab.
- The display consists of a series of coloured lights that indicate to the operator whether the machine is in a longitudinally stable



## LLMI – How It Works

- As the load is extended forwards the load on the rear axle will decrease.
- This rear axle load is monitored by the LLMI in relation to the load on the rear axle when the machine is calibrated.
- The calibration ensures there is sufficient load on the rear axle when the load limit is reached, for the 540-170 this is 1300kg .

## LLMI – How It Works

- The lights on the LLMI display progressively illuminate as the load is extended and the weight on the rear axle reduces.
- At the orange light the rear axle load will be 1300kg.



# LLMC - Longitudinal Load Moment Control

- The Longitudinal Load Moment Control system takes a signal from the LLMI and at pre-determined limits reduces the hydraulic flow to the boom services.





## LLMC - Functionality

- At the 100% limit - the system prevents further movements that will reduce the stability.
  - Extending
  - Lowering
  - Fork dump & crowd
- Movements that improve stability can be made without additional operator actions.

## LLMC – Manual Override

- Momentary override
  - Press top button followed by bottom button and hold both buttons for 10s.
  - With the buttons held the boom can be operated in all directions.
  - Releasing either button will stop the override function.

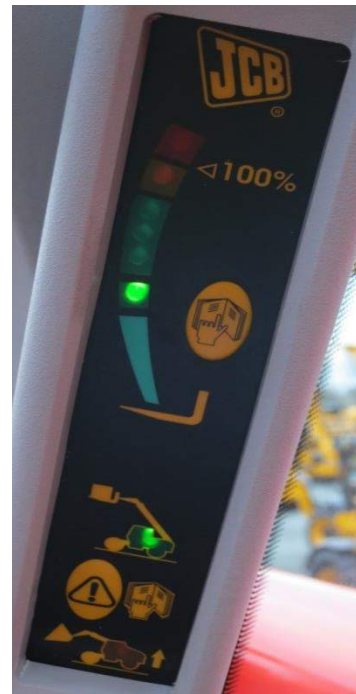


## LLMC – Automatic Override

- The LLMC is automatically overridden when the boom is fully retracted, as permitted by the EN15000 standard.
- To improve machine operation when using a bucket.



Boom  
retracted



Boom  
extended

## Summary

- The load charts and an appropriate risk assessment are key to planning lifting operations.
- The operating envelope interlocks have been established by JCB.
- The sensors and interlocks fitted to JCB Loadalls are designed to maintain machine's working limits within the lift envelope.
- The Adaptive Load Control is requirement



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