

# Australian inventions for sustainable farming



What is the name of the invention or new knowledge ?

Mailler's Beeline Navigator Auto-steering System–  
applying a Global Positioning System  
for hands-free steering for machinery



What did it look like ?

There is a photo of the Beeline Navigator computer and read out at the Australian International Design Awards 2001 website at <http://www.gooddesignaustralia.com/awards/past/entry/beeline-navigator4/?year=2001>

When was it known ?

1994  
(in the media)

Pinder, Simon review of *Tall but true tractor tales* on 30 May 2012 on the web at *Weekly Times* website [www.weeklytimesnow.com.au/article/2012/05/30/487661\\_country-books.htm](http://www.weeklytimesnow.com.au/article/2012/05/30/487661_country-books.htm)

Who was the scientist?

Robert Mailler  
a mathematician and computer systems engineer  
son of a farming family,  
from Boggabilla NSW.,

For more details about the story of Robert Mailler on farm and developing this concept see *Navigating a path to success*, by Cameron Cooper, first published in the *Australian* on Oct 26 2007 and available on line *the Australian* website at [www.theaustralian.com.au/business/navigating-the-path-to-success/story-e6frgafx-1111114658218](http://www.theaustralian.com.au/business/navigating-the-path-to-success/story-e6frgafx-1111114658218)



What need was there for this?

Rob had asked his Dad Mike, what he needed. His Dad said “Make me a tractor that can drive straight.”

Human steering of the tractors had the possibility that some of the paddock could be missed and some could be done twice during cropping, spraying and harvesting.



This could be due to:

- Lack of visible signs in dry soils or stubble crops
- Driver fatigue

The effects on farm costs were:

- 10-15% more of fuel, chemicals and seeds was known to be used over what should be needed for accurately covering a typical paddock.
- Chemical double –ups can kill seeds or plants rather than protecting them

There were mechanical methods of auto-steering already but they didn't really work that well and they had not spread far from their farmer inventors.

For more information on the background to this invention see:

Quick, Graeme Ross. *Remarkable Australian Farm Machines*, 2007 Dural: Rosenberg Publishing pp 153-7 (also available on line)

Cooper, Cameron. *Navigating a path to success*, Oct 26 2007 published on liine at *the Australian* website at [www.theaustralian.com.au/business/navigating-the-path-to-success/story-e6frgafx-1111114658218](http://www.theaustralian.com.au/business/navigating-the-path-to-success/story-e6frgafx-1111114658218)



### What was the discovery that led to this invention?

A group of satellites can be used to pinpoint a tractor and guide it in real time.

Satellite technology was made available to commercial interests in the 1980s. This had led to GPS technology, but the military gave it an error, for their protection.

Mailler first worked out how to add a satellite-guided visual array to his Dad's farm machinery, then he worked on making a system to use the satellites.

For more information on the background to this invention see:

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### How does it work ?

The key points are:

- the transmitter/receiver and computer sits in the tractor cab
- up to four satellites at the same time transmit the GPS information to the tractor about its speed, postion and time
- the computer compares the information and works out the exact position of the tractor and any need to change course.
- computer sends signal to steering to modify course if needed as it moves over the paddock and over its contours

For more information on the specific design of this invention see *Beeline Navigator* at the Australian Internation Design Awawrds website

<http://www.gooddesignaustralia.com/awards/past/entry/beeline-navigator4/?year=2001>





## What shows its importance as an Australian discovery/invention ?

This invention was considered so important that it won the 2001 Australian International Design Award.

Reference Recognition at CMD website <http://www.cmd.net.au/what-we-do/recognition/>

<b>Business set up on it</b>	<b>Mailler and his family set up Beeline Technologies.</b>
<b>Where used on farm</b>	<b>in paddocks on tractors</b>
<b>Changes it made to farming</b>	<b>big savings in fuel, chemical, seeds, time from</b> <b>1. loss of doubling up over parts of paddock</b> <b>2 loss of parts of paddock being missed as the tractor only moves over the land</b> <b>3. once, fully and accurately covering the paddock.</b>
<b>Contribution to sustainability</b>	<b>1 lowered fuel costs</b> <b>2 lowered chemical costs</b> <b>3 lowered seed costs</b> <b>4 no double spraying to kill seeds/plants</b> <b>5 farmer is quicker at getting the paddock covered fully and accurately</b> <b>= ie made the farming enterprise more efficient</b>
<b>How quickly adopted</b>	<b>almost straight away</b>
<b>The places it spread to</b>	<b>across Australia</b> <b>then adopted in USA within 4 years</b>
<b>Changes made to it for today</b>	<b>adopted by no-till and conservation farming methods.</b> <b>improvements in the GPS technology have taken the accuracy of the auto-steering from 1m in 1994 to .5m and now to 2cm in 2013.</b> <b>This makes sowing possible between the rows of stubble from the previous crop, so that there is no need for burning or slashing the stubble – enhancing no-till farming methods further.</b>
<b>Still in use today</b>	<b>yes</b>
<b>Current use in the Wimmera-Mallee</b>	<b>used by most farmers now</b>
<b>Led to other knowledge or invention</b>	<b>has been adapted for military and mining machinery as well as farm machinery</b>





## Shape Sleuths Link – An exercise for the 2013 Maths of Planet Earth

1 Draw the simple shapes that make up :

- *The Beeline Navigator from the photo of it at the Aust Design Award website.*

2 Name the shapes that are found in your drawings above.

3 Draw up two rectangles of 10 cm by 10cm as a map of a paddock of 1 ha.

- *In the first rectangle, try **freehand** drawing lines 1 cm apart to represent a farmer going over the land cropping without any guide other than his eyes and steering. (Cropping means putting in the seed.)*
- *In the second rectangle, use a ruler to draw lines 1 cm apart to represent a farmer going over the land cropping with a GPS guide to keep his lines straight and evenly separated.*
- *How many gaps did you leave on the first square compared with the second? This would be the land that missed getting seed.*
- *How many touchings did you make on the first compared with the second? This would be the land that got too much seed.*
- *What does this save in time and money if the farmer gets his lines straight and evenly spaced?*

4 If you have a chance to see a tractor with GPS in reality, find out from the farmer:

- *How he uses it*
- *How much money it cost and has saved him*
- *how quickly he bought it after it became available*

### For further information :

#### Books

Quick, Graeme Ross. *Remarkable Australian Farm Machines*, 2007 Dural: Rosenberg Publishing pp 153-7 . This book is also available on-line.

#### Websites

*Beeline Navigator* at *Australian International Design Awards 2001* website at <http://www.gooddesignaustralia.com/awards/past/entry/beeline-navigator4/?year=2001>

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*Recognition* at *CMD* website at <http://www.cmd.net.au/what-we-do/recognition/>

#### People

*personal communication* by D. Liersch, Farmer, Homecroft in the Wimmera





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