



# Class A4 Pacific Steam Locomotive

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## 1 History

### 1.1 History/ Origin

The LNER's Express Pacific designs were probably the most famous of the LNER locomotives. And of these Pacifics, the A4 is probably the most famous of all: Its distinctive streamlined shape has come to be a symbol of 1930s luxury and speed. Even today, it is an A4 which holds the world speed record for any steam locomotive in the world.

Nigel Gresley travelled on the 'Fliegende Hamburger' (a high-speed diesel electric) on a visit to Germany and was inspired by its fast average times and streamlining. From this, he calculated that a streamlined and modified A3 design would be able to haul trains of eight or nine carriages at similar speeds.

The wedge-shaped streamlining on the A4 was inspired by a Bugatti rail-car which Gresley had observed in France. As well as streamlining, it was important that the design lifted smoke up away from the cab. At first, there was a lot of difficulty in achieving this. During the wind

tunnel tests, it was noticed that a thumb print had inadvertently been added to the plasticine model, just behind the chimney. The model was re-tested with the thumb print and amazingly the smoke was lifted well clear of the cab!

As well as the characteristic streamlining, a number of other things were modified from the A3 design. All of the steam passages were streamlined. The boiler pressure was increased from 220psi to 250psi. The cylinders were decreased slightly in size so that the valve diameters could be increased to 9 inches. This produced free steaming within the restrictions of the 3 cylinder design. As with the A3, Walschaerts gear was used on the outside cylinders, and Gresley's conjugated gear was used for the inside cylinder. Further refinements were added at a later date, including the Kylchap double-blastpipe exhaust.

A demonstration run from Kings Cross to Grantham on 27th September 1935 touched 112.5mph. Soon the rival LMS had matched the LNER's speed record with 114mph!

With these increasing speeds, braking distances were getting longer, and so methods to improve braking were investigated. Gresley favoured the use of a system produced by Westinghouse (and already in use on the LMS), and so trials began in 1938. Trials typically required rapid acceleration followed by the brake test. On 3rd July 1938, the Westinghouse team arrived to find that the train consist had changed. Some of the coaches had been removed and replaced with the dynamometer car. Also, the locomotive had been changed to 4468 *Mallard*. Only 4 months old, this A4 was the first to be fitted with the Kylchap double-blast pipe. The driver was also different - J. Duddington, who had been brought down from Doncaster and had a reputation for running trains hard when it was required. Duddington was joined by fireman T. Bray, and inspector J. Jenkins. When the Westinghouse team were onboard, they were told that they were going to attempt to break the speed record.

The Down journey consisted of conventional brake tests. At Barkston, the Westinghouse team were given the option of taking a taxi to Peterborough - they all refused! The centre big bearing was drowned in cylinder oil, and the return journey commenced. Grantham was passed at 24mph. By Stoke signal box, the speed had reached 74.5mph with full regulator and 40% cut-off. At milepost 94, 116mph was recorded along with the maximum drawbar of 1800hp. 120mph was achieved between milepost 92.75 and 89.75, and for a short distance of 306 yds, 125mph was touched.

A peak of 126mph was marked on the dynamometer rolls, and this speed was included in some unofficial reports. 126mph is also the speed marked on the plaque BR mounted on *Mallard* in 1948. Gresley never accepted this speed of 126mph, and thought it misleading. The LNER only claimed a peak average of 125mph - so breaking the world record for steam traction held by the German State Railways (124.5mph) and the British record set by the LMS (114mph).

When *Mallard* arrived at Peterborough it was found that the centre bearing had overheated. It was then towed to meet the press at Kings Cross behind an Ivatt Atlantic. This must have led to some confusion, but the overheated bearing was quickly re-metalled. A further check was

made that everything was okay, and Mallard was back in revenue-earning service within 9 days.

Over 60 years later, Mallard's record of 125mph still stands.

In 1948 the class entered BR ownership. 60007 Sir Nigel Gresley holds the Post War steam record at 112mph, which it attained on 23 May 1959.

6 A4's have been preserved and are represented in this pack. Mallard is part of the National Collection and is on display at the National Railway Museum. Sir Nigel Gresley is based at the North Yorkshire Moors Railway and is also registered for use on the mainline, along with sister locos Bittern and Union of South Africa. These three locomotives have also had air brake equipment fitted. Dominion of Canada and Dwight D. Eisenhower have been temporarily repatriated from their respective homes 'across the pond' to help celebrate the 75<sup>th</sup> anniversary of Mallard's record-breaking run in 2013.

#### **A4 Specifications:**

Designer	Sir Nigel Gresley
Builder	LNER Doncaster
Class	A4
Numbers	LNER: 2509 - 2512, 4462 - 4469, 4482 - 4500, 4900 - 4903 BR: 60001 - 60034
Build Date	1935 - 1938
Wheel Arrangement	4-6-2
Tractive Effort	35,455 lbf
Weight	167 tons 2 cwt (including tender)

## 2 Rolling Stock

The following rolling stock is available in this Add On.

### 2.1 Mallard



### 2.2 Bittern



### 2.3 Dominion of Canada



### 2.4 Dwight D. Eisenhower



## 2.5 Sir Nigel Gresley



## 2.6 Union of South Africa



## 2.7 Mk1 Coach Set

There are a set of BR Maroon liveried first (FK), second (SK), Restaurant Mini Buffet (RMB), brake second (BSK) and brake guard (BG) coaches supplied in this add-on. In the browser list they are listed as "A4 Mk1 First BR Maroon", "A4 Mk1 Second BR Maroon", "A4 Mk1 RMB Mini Buffet BR Maroon", "A4 Mk1 BSK Brake Second BR Maroon" and "A4 Mk1 BG Guard BR Maroon".



## 3 Scenarios

### 3.1 A4 Pacific Tutorial

Prepare for the upcoming speed trials by learning how to drive an A4 Pacific.

- **Duration** 10 minutes
- **Start Location** Clapham Junction
- **Type** Standard

### 3.2 Timed Scenarios

Drive from London Victoria to Brighton. The timed run is measured from Clapham Junction to Preston Park. Tip. Watch out for AWS warnings and some bends on this route.

- **Duration** 60 minutes
- **Start Location** London Victoria
- **Type** Standard

### 3.3 Quick Drive Consists

Each livery comes with quick drive consists.

## 4 Acknowledgements

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