Byrne Seminar
The History and Future of High Speed Passenger Trains
France

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France High Speed Passenger Trains

Statistics

- French Republic (Republique française)
- Comparison with US

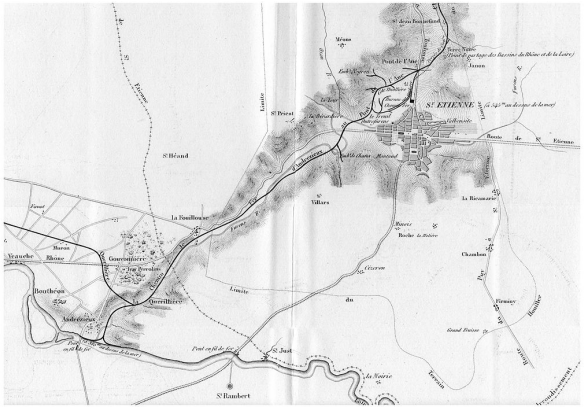
Item	*France*	*US*
Area	0.64 M km^2	9.8 M km^2
Driving side	right	right
GDP (nom)	\$ 2.7 T	\$ 22.3 T
GDP (PPP†)	\$ 3.1 T	\$ 22.3 T
Population	67 M	328 M

†Purchasing Power Parity

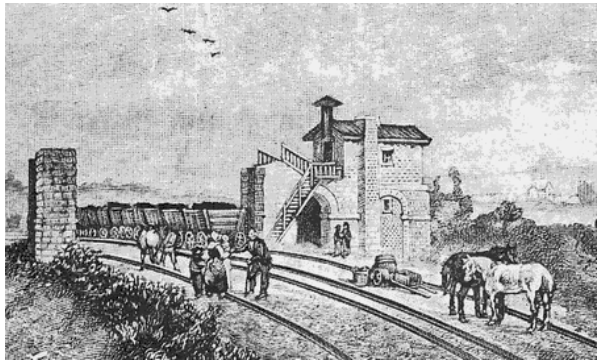
France High Speed Passenger Trains

History

- The first railway was established by decree in 1824 establishing Compagnie du chemin de fer de Saint-Étienne à la Loire
- Initially limited to hauling coal, the railway began transporting passengers in 1832
- Steam locomotives were introduced in 1844
- The length was 18 km
- Standard gauge



Saint Étienne railway



Saint Étienne station

France High Speed Passenger Trains

SNCF

- Société nationale des chemins de fer français
  - "chemins de fer" translates strictly as "paths of iron"
- State-owned national railway
- Founded in 1938 by nationalization of private French railways
- Operates national rail traffic including Monaco
- Total network 32,000 km
- High speed network 1800 km
- Operates 14,000 trains daily

SNCF logo

SNCF ticket machine

France High Speed Passenger Trains

TGV

- SNCF began development of TGV in 1966
- Originally designed for turbotrains
  - Powered by gas turbine (and possibly also diesel) engine
- Four different turbotrains were operated
  - TGS (Turbine à gaz spéciale) prototype
    - Set record of 252 km/hr on 15 October 1971
  - Class T 1000 ETG (Élément à Turbine à Gaz)
    - Max speed 160 km/hr
  - Class T 2000 RTG (Rame à Turbine à Gaz)[1]
    - Max speed 160 km/hr
  - TGV 001 experimental high-speed train
    - Set world speed record for gas turbine powered train at 318 km/hr on 8 December 1972
- Turbotrain concept abandoned due to 1973 oil crisis and TGV switched to electric powered trains

[1] Six units were delivered to AMTRAK

France High Speed Passenger Trains

TGS

- Turbine à gaz spéziale
- Experimental turbotrain
- Testing started in 1967
- Reached 252 km/hr in 1971
- Not introduced into passenger service
- Succeeded by Class T 1000 ETG

TGS

Gas turbine engine

France High Speed Passenger Trains

Class T 2000 RTG

- Rame á turbine à gaz
- Second generation of turbine powered trains
- Passenger service from 1972 to 2004

Item	*Value*
Formation	13
Length	128.90 m
Engine	Turboshaft
Fuel	Diesel
Gauge	Standard
Max speed	160 km/h
Fuel rate	430 litres/hr
Manufacturer	ANF

T 2000 RTG

T 2000 RTG

France High Speed Passenger Trains

ANF

- Ateliers de Construction du Nord de la France
- French locomotive manufacturer
- Founded 1882
- Acquired by Bombardier Transportation in 1989

France High Speed Passenger Trains

AMTRAK RTG 2000

- AMTRAK purchased a set of gas turbine trainsets in 1973
- Built by ANF
- Multiple routes in midwest US
- Trainset comprises two power cars (with seating), two coaches and bar/grill
- Two Turbomeca Turmo III turbines

AMTRAK RTG 2000

France High Speed Passenger Trains

TGV

- The TGV is the French high speed train
- TGV is an acronym for Train á Gran Vitesse (high-speed train)
- TGV trains are operated by the French railway organization SNCF

France High Speed Passenger Trains

TGV 001

- First TGV prototype began testing in 1972
- Experimental gas turbine-electric trainset
- Different design from ETG and RTG
- Two locomotives and three carriages
- Articulated train (shared bogies)
- Set land speed record at 318 km/hr
- Not for passenger service
- Tests concluded in 1978

TGV 001

TGV 001

France High Speed Passenger Trains

TGV

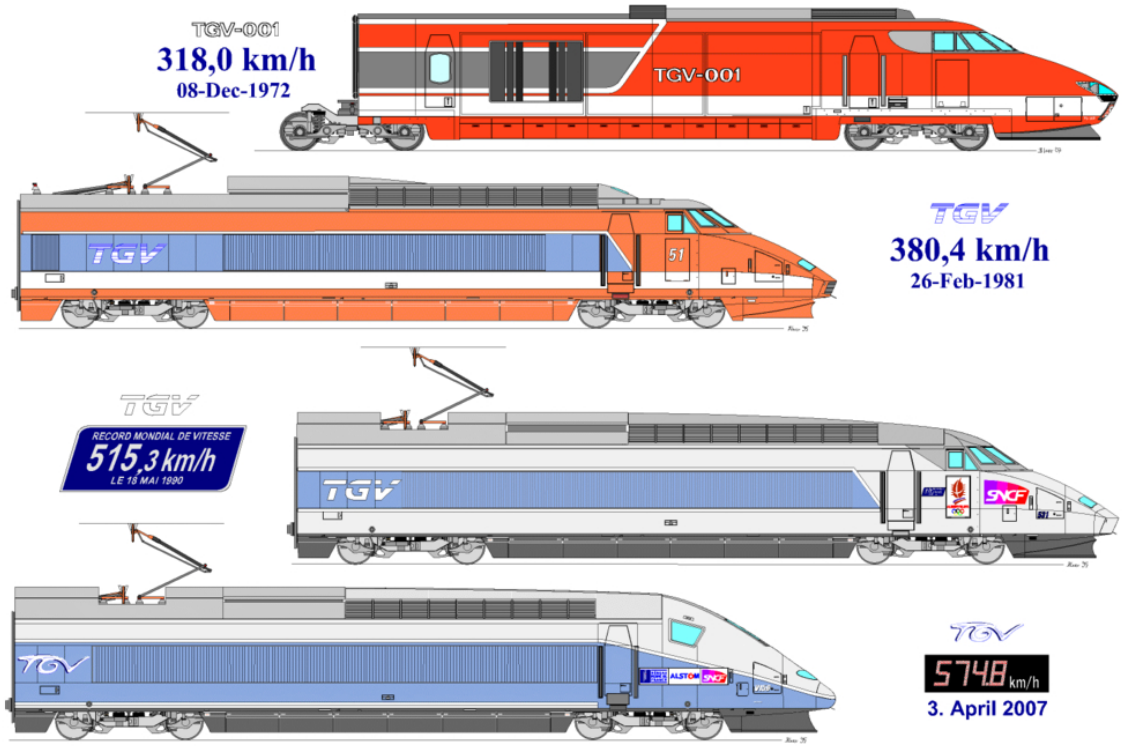
- Passenger service began in 1981
- Initial route Paris-Lyon
- Same ticket price as conventional trains
- Popular with public

TGV

France High Speed Passenger Trains

TGV

- Throughout its history the TGV has set multiple speed records



France High Speed Passenger Trains

TGV Atlantique

- TGV Atlantique

Item	*Value*
Formation	12
Length	237.5 m
Width	2.8 m
Electric system	25 kV, 50 Hz
Track gauge	standard
Passengers	459
Max speed	320 km/hr
Manufacturer	GEC-Alsthom
Number built	105
In service	1989 -

TGV Atlantique

France High Speed Passenger Trains

TGV Réseau

- TGV Réseau

Item	*Value*
Formation	10
Length	200.19 m
Width	2.81 m
Electric system	25 kV, 50 Hz
Track gauge	standard
Passengers	361
Max speed	320 km/hr
Manufacturer	GEC-Alsthom
Number built	90
In service	1993 -

TGV Réseau

France High Speed Passenger Trains

TGV Duplex

- TGV Duplex

Item	*Value*
Formation	10
Length	200 m
Height	4.3 m
Electric system	25 kV, 50 Hz
Track gauge	standard
Passengers	508
Max speed	320 km/hr
Manufacturer	GEC-Alsthom Alstom
Number built	89
In service	1995 -

TGV Duplex

France High Speed Passenger Trains

TGV POS

- TGV POS

Item	*Value*
Formation	10
Length	200.19 m
Width	2.81 m
Height	4.1 m
Electric system	25 kV, 50 Hz
Track gauge	standard
Max speed	320 km/hr
Manufacturer	Siemens
Number built	19
In service	2006 -

TGV POS

France High Speed Passenger Trains

Operation V150

- Operation V150 was a joint effort by SNCF, TGV manufacturer Alstom and LGV Est owner Réseau Ferré de France to reach 150 m/s (540 km/hr)
- The tests were conducted between 15 January 2007 and 15 April 2007
- The world record was set on 3 April 2007
- Top speed of 574.8 km/hr (159.6 m/s, 357.2 mph)
- The top speed was reached 12 minutes 40 seconds and 73 km after leaving Prény from a standstill