



**The global market  
for automotive  
transmissions:  
forecasts to 2010**

March 2003

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# The global market for automotive transmissions: forecasts to 2010 (SAMPLE)

Author: Jeff Daniels

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## About the author

Multiple award-winner Jeff Daniels preceded his career in the automotive industry with a degree and background in Aeronautical Engineering. He went on to various journalistic and editorial roles including roles with *Motoring Which?* and *CAR* magazine.

After some time spent as PR manager for Datsun in the seventies he returned to *Autocar* as Technical Editor before another PR spell for Citroen UK before going freelance in 1979.

He has since produced countless articles, reports and commentaries, mainly on technical aspects of the industry. His customers include the Economist Intelligence Unit, the Financial Times, *Automotive Engineer*, *just-auto.com*, *European Automotive Design*, *Motor Industry Management*, and other newspapers and specialist magazines.

He has also written a number of books ranging from *"British Leyland - the Truth About the Cars"* (1980), *Modern Car Technology* (2002 - for which he won the Pierre Dreyfus Award as UK Motoring Journalist of the Year), and *"Driving Force - the history of the Passenger Car Engine"* (2003). He continues to work as a journalist, author, translator and broadcaster - his last television appearance was on BBC 2 in February 2003.

## Chapter 1 Background & basic requirements

### Requirement: the need for transmission

Every self-propelled road-going vehicle needs some form of transmission to take the output from its power unit to the driven wheels. The vast majority of vehicles are powered by internal combustion engines, and a large part of the task of the transmission in these vehicles is to compensate for the inherent drawbacks of the engine - in particular, its need to remain running when the vehicle is stationary, and the limited range of speed within which it develops sufficient torque to drive the wheels. To overcome the first problem, some kind of clutching arrangement is necessary. To overcome the second, the transmission needs to include a gearbox providing a range of different ratios of input to output speed, enabling the engine's speed to be maintained within the useful range of torque output over a more or less wide range of vehicle speeds. So important have these solutions become that "*transmission*" has in many minds come to mean that part of the system between the engine output and the gearbox output, neglecting the many complexities which exist between the gearbox output and the driven wheels.

The greater part of this report sets out to deal with the transmission in this more restricted sense. It must still be borne in mind that significant engineering problems need to be overcome in the design of the final drive and differential unit which provides a further gearing element while dividing the input torque equally (in most cases) between the driven wheels, and in the design of the jointed propeller and/or drive shafts which carry the drive to the wheels themselves.

### Overall solutions

For the first half-century of the practical internal combustion engined road vehicle, there was only one form of transmission. This consisted of a friction clutch, operated by the driver via a pedal, and a gearbox in which various ratios could be selected by the driver, using some form of lever acting on the actual selector mechanism. By 1940 this arrangement had been brought to a level of development which enabled vehicles to be driven without requiring any great strength or skill on the part of the driver. That development has continued, to the point where both the main components of a modern “*manual*” transmission - the clutch and gearbox - are now almost entirely foolproof in operation, with high reliability and resistance to wear, even if (accidentally or deliberately) mistreated.

At the same time, from the 1920s onwards, there was a desire to free the driver altogether from the need to operate the clutch and gearbox. Up to the 1930s many systems were tried, but with a consistent lack of success. However, in 1940 General Motors introduced the first Hydra-Matic automatic transmission, and installation of the first automatic transmission pattern for most of the world. Today, automatics in use today are a far cry from the original, but they still place of the manually operated gearbox, delivering a range of gear ratios, and various elements of control, such as lock-up, hydro-mechanical selector, and so on, to an automatic input signals, primarily vehicle speed and acceleration.

### The overall market

Evidently, every new vehicle sold in the new vehicle market is a “*personal vehicle*” for personal use within the “*passenger car*” trade Area, where they accounted for nearly 40% of the total. In 2002, over 40 million light commercial vehicles sold as such, but with very different requirements, marketed as “*commercial vehicles*”, mainly used for freight and delivery. In 2002, over 40 million transmissions were sold in the “*commercial vehicles*” total market for around

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ansmission. The size of the “*commercial vehicles*” market. Sales of light trucks sold in the “*commercial vehicles*” trade Area, where they amounted to just over 40 million light commercial vehicles sold as such, but with very different requirements, marketed as “*commercial vehicles*”, mainly used for freight and delivery. In 2002, over 40 million transmissions were sold in the “*commercial vehicles*” total market for around

It is accepted that the figure will grow, although in present circumstances (as at March 2003) forecasts of growth are understandably being revised down. Vehicle sales grew by only xx% in the period 19xx-20xx, and most of that growth was achieved in the first two years, followed by a falling-back. Most recent forecasts assume a flat-line period out to 2005 followed by a slow acceleration led by the larger markets of the developing world, primarily in Asia. Forecasts prepared for this report, and shown in Table 1, taking the current economic downturn and future uncertainties into account, suggest a world market for private passenger and light commercial vehicles of xxx million by 20xx, compared with xxx million in 20xx.

**Table 1: Total vehicle market by area (includes cars, light trucks and LCVs)**

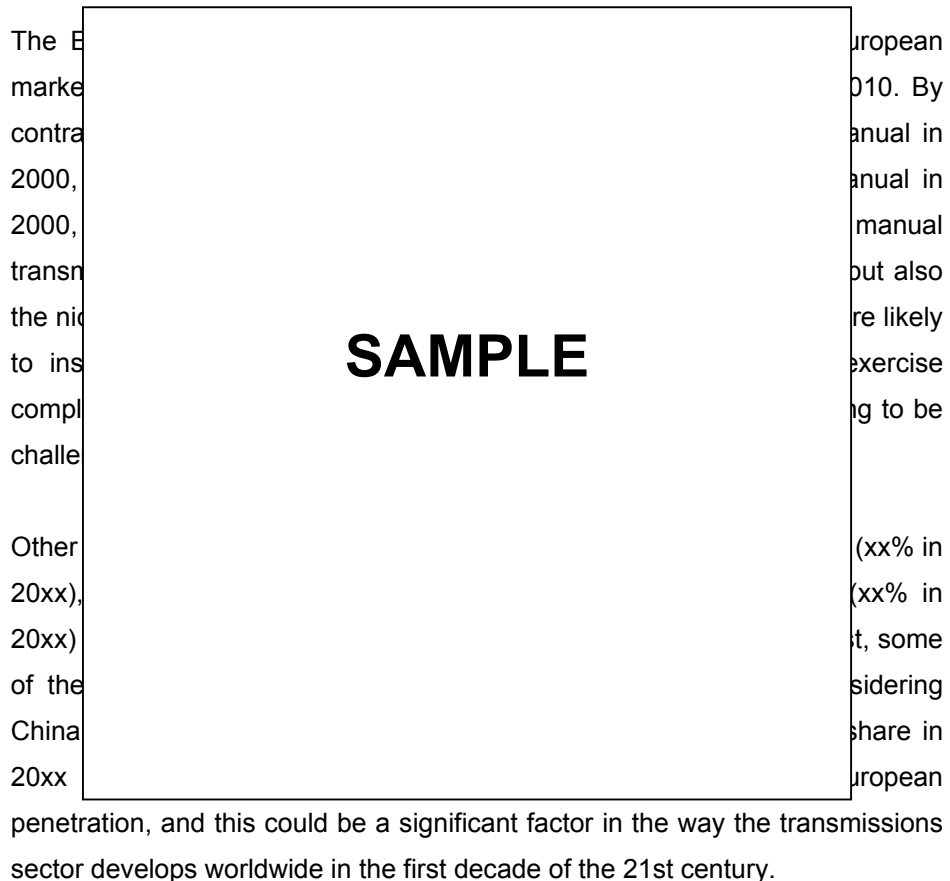
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
NAFTA	19										4
W Europe	16										6
E Europe	28										0
Asia	53										2
Japan	58										0
Mercosur	16										3
Other*	47										3
Total	57										8

\* Other includes Oceania, South African, non-Mercosur South America, North and West Africa, Middle East

Source: Published world production figures to 2002; just-auto.com forecasts

Within the last two decades, by virtue of its convenience in use, the automatic transmission has become by far the majority choice for new-production passenger cars and light commercial vehicles in two of the three major developed, vehicle-producing areas - North America and Japan. It has done so despite the fact that it costs considerably more, weighs more and is bulkier than a manual transmission for the same vehicle application.

It is sometimes assumed that by virtue of its preponderance in these two large markets, automatic transmission must now be in the majority world-wide. Detailed analysis shows that this is not the case. The manual transmission remains in the overall majority because of its predominant position in Europe and, to a considerable extent, in the rest of the world. In Europe the manual is still very much in the majority for three main reasons. First, the high cost of the automatic becomes more significant within the context of the smaller cars which form the bulk of European production. Second, the automatic has a reputation - well founded until the 1990s - of making a car less economical, and this remains a serious consideration in Europe where motor fuel is generally more expensive than elsewhere in the world, because of high taxation. Third, many European drivers - especially those in the Latin nations - still cherish the idea that expertise in the use of manual transmission is in itself a virtue.



The steady growth in demand for automatics in markets outside North America and Japan has medium-term implications for the overall shape of the transmissions industry. Analysis conducted for this report suggests that world-wide, automatics will take more than xx% share of all transmission production for new vehicles by 20xx, and that by 20xx automatics will command a xx% share of the market. At that stage, world-wide demand should amount to around xxx million manual transmissions - of which in turn nearly xx% will be supplied in western Europe - and 34.9 million automatic transmissions.

### **Technical alternatives**

While the concept of the manual transmission is stable and well understood, several innovative automatic transmissions continue to challenge the dominance of the torque converter/epicyclic gearbox arrangement. Principal among these, in terms of numbers and of time in the market, is the belt-and-pulley continuously-variable transmission (CVT). Possible alternatives include the roller-in-toroid transmission often referred to as the infinitely variable transmission (IVT) to distinguish it from the CVT, the alternative clutch-and-epicyclic configuration invented by Roumen Antonov, and various approaches to the concept of a fully automated layshaft transmission, sometimes referred to as the automated manual transmission (AMT).

In theory, other forms of transmission are possible including electrical and hydrostatic types, with drive motors mounted directly within the wheel hubs. Such transmissions are found in specialised heavy-duty machines in the mining and civil engineering sectors but have never been seriously considered for light-duty vehicles. In the case of hydrostatic systems, noise has proved a major problem. Electric transmissions have been more carefully considered for internal combustion/electric hybrid vehicles but the weight of hub-mounted electric motors remains a drawback, since it forms part of the unsprung mass of the vehicle and therefore detracts from roadholding and ride comfort.

There have been many attempts to replace conventional manual transmissions with servo clutches. Such systems have been offered since the 1950s, incorporating various technologies, but none has ever achieved widespread adoption. In the late 1990s, this trend continued with some systems some of which were marketed as a "half-way" solution between conventional manual and automatic - usually of the latter type - seems to have been the only one that consumers ever to succeed.

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"half-way" solution between the conventional manual transmission, in the form of the servo clutch. It is not the appropriate gear but the clutch is offered at least since the 1950s, incorporating various technologies, but none has ever achieved widespread adoption. In the late 1990s, this trend continued with some systems some of which were marketed as a "half-way" solution between conventional manual and automatic - usually of the latter type - seems to have been the only one that consumers ever to succeed.

Over 80 pages of information have been removed from this report for the purpose of creating this sample document.

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