



Why Low Tar Cigarettes Don't Work and How the Tobacco Industry Has Fooled the Smoking Public

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Low Tar Cigarettes and Smoker Compensation

- Summary**
- Smokers could be forgiven for believing that low tar cigarettes deliver less tar to the smoker's lungs. *However, the actual tar exposure, and hence health risk, from smoking low tar brands may be almost the same as for conventional cigarettes.*
 - Tar and nicotine yields are shown on cigarette packs and adverts and are reasonably interpreted by consumers as indicating the relative harmfulness of the product. Conventional brands such as Benson and Hedges King Size yield 12 milligrams (mg) of tar, whereas low tar cigarettes such as Silk Cut Ultra report yields as low as 1 mg tar – only one twelfth as much. However, these yields are measured by a machine. Smokers in the real world do not smoke cigarettes in the same way that machines do.
 - In fact smokers modify their behaviour to ensure they inhale enough smoke to achieve a satisfactory nicotine 'hit'. But by increasing their intake of nicotine, smokers also take in more tar. Nicotine is powerfully addictive and smokers are trying to ensure they sustain a desired level of nicotine in the blood.
 - With low tar cigarettes this means they 'compensate' by taking more or deeper puffs, or by consciously or subconsciously blocking ventilation holes in the filter with fingers, saliva or lips. Ventilation holes are placed in the filter to draw in up to 80% air when the cigarette is tested on a machine.
 - When filter ventilation holes were blocked in smoking machine measurements conducted at the Laboratory of the Government Chemist for ASH and *The Observer*, measured tar yield rose by up to a factor of twelve - in the case of Silk Cut Ultra it rose from 1 mg tar to 12 mg - similar to a standard Benson and Hedges cigarette. *These results are set out on page 4 of this report.*
 - The tar and nicotine measurement and labelling regime provides misleading and potentially harmful consumer information. Smokers concerned about health effects of smoking may be switching to these products rather than quitting.
 - Internal tobacco industry documents released during US tobacco litigation show that the tobacco industry has known of this effect for many years, has designed cigarettes that would give low machine readings but high yield when smoked by people, and has continued to imply that these cigarettes are somehow more healthy while concealing their real dangers. *Part 2 of this report quotes from tobacco industry documents showing what the industry knew and how it behaved.*
 - Regulators in the United States are now advertising to warn consumers against placing any value on tar and nicotine yields printed on packs. The Federal Trade Commission, FDA and National Cancer Institute of the US no longer believe there are health benefits associated with switching to low tar brands.
 - There is an opportunity to change this regime as the European Commission is preparing proposals to replace the existing Directives that cover tar and nicotine measurement, regulation and labelling.

Part 1. Explanation of low tar cigarettes and smoker compensation

- What a rational consumer might expect from low tar cigarettes** As a response to widespread health concerns, tobacco companies have introduced low tar brands such as Silk Cut Ultra and Marlboro Lights. These brands are packaged in such a way as to imply they are less harmful than conventional cigarettes. The tobacco companies do not make direct health claims for these products, but the notion that they are less dangerous is implied by the name given (Light, Low etc) and the tar and nicotine content label on the pack which shows much lower contents than conventional cigarettes. For example, a Silk Cut Ultra is rated at 1 mg of tar whereas a conventional Benson and Hedges cigarette is rated at 12 mg. It would not be surprising if many smokers thought that smoking the Silk Cut Ultras would result in one twelfth the exposure to tar and therefore roughly one twelfth the health risk. But this is not the case - far from it.
- How do low tar cigarettes work?** The quantity and quality of tobacco in a low tar cigarette is very similar or identical to that in conventional cigarettes. Low tar cigarettes do not rely on 'low tar tobacco' because there is no such thing. The difference is almost completely in the filter and the way this performs when tested in a smoking machine. The filter works in two ways: it retains tar and nicotine as smoke is drawn through the filter and, importantly, it can have ventilation holes that allow air to be drawn in to mix with the smoke. In some cases the fresh air drawn accounts for over 70% of the puff¹. This mixing of air with the smoke reduces the apparent tar and nicotine content of the smoke. This means the official cigarette testing machine registers a low tar reading for the cigarette. However, human smokers are not machines, and they respond to the low tar cigarette by changing the way they smoke.
- What happens in practice when low tar cigarettes are smoked** Smoking behaviour is determined largely by the smoker's need to consume nicotine. This addictive substance is the basis of smokers' satisfaction and a smoker will adjust smoking behaviour to consume enough nicotine to achieve a satisfying nicotine 'hit'. With low tar cigarettes, smokers can adopt a range of 'tricks' to ensure they take in the nicotine they need, even if the cigarette is supposed to be low in tar and nicotine. These include: drawing more deeply; taking more puffs per cigarette; smoking more of the cigarette; blocking ventilation holes in the filter with fingers or saliva. These 'tricks' may be performed unconsciously as a smoker subliminally learns how to achieve a satisfying smoke from a low tar cigarette. Since tar intake is closely linked to nicotine intake, the tar exposure also increases. This effect is known as 'compensation' and has been extensively documented in the scientific literature^{2, 3} and well understood by the tobacco industry for over twenty years.
- Why are the official tar and nicotine numbers not a reliable guide?** The numbers printed on packs and on the warning portion of tobacco advertisements are the results of measurements on a standard smoking machine using ISO standard procedures and equipment⁴. The smoking machine has a mechanical mouth and draws a fixed number of standard puffs - a 35cm³ volume drawn over 2 seconds repeated every 60 seconds until the cigarette burns down to a predetermined butt length. The tar and nicotine residues drawn into the machine are then measured. The smoking machine does not set out to emulate actual smoking behaviour, nor does it take account of the compensation tricks mentioned above. In fact it *grossly* understates the tar

burden that a typical low tar cigarette smoker will suffer - as the tests below indicate.

How bad are low tar cigarettes?

In 1998 ASH and *The Observer* commissioned tests designed to measure the impact of one of the compensation mechanisms listed above. The tests were performed on the official cigarette testing machine (Filtrona SM400) of the Laboratory of the Government Chemist in Twickenham, near London⁵. The laboratory blocked the ventilation holes in the filters of Silk Cut Ultra King Size and Marlboro Lights King Size cigarettes in order to mimic the effect of a smoker using fingers and saliva to block the holes or placing more of the filter in his or her mouth. Three tests were performed - without blocking and with the holes half blocked and fully blocked. Sellotape was used to cover the holes. These are the results for tar and nicotine measurements (in milligrams per cigarette):

Results of measurements by the Laboratory of the Government Chemist

		Silk Cut Ultra		Marlboro Lights	
		Tar	Nicotine	Tar	Nicotine
Displayed on the pack		1 mg	0.1 mg	6 mg	0.5 mg
Measured	No blocking	1.4 mg	0.16 mg	6.3 mg	0.54 mg
	Half blocked	4.5 mg	0.56 mg	7.6 mg	0.62 mg
	Fully blocked	12.3 mg	1.21 mg	10.5 mg	0.77 mg

Note: for comparative purposes Benson and Hedges Special Filter, the best selling UK cigarette, has 12 mg tar and 1.0 mg nicotine yield displayed on the pack.

People do block the holes in practice

Experimental evidence shows that people do block holes in practice. Kozlowski et al⁶ measured filter staining in cigarette butts and found that 58% of low tar cigarettes showed signs of significant hole-blocking and 19% showed signs of extreme hole blocking. Thus a majority do block holes.

The results show that official measurements are completely meaningless

The measurements above show that just one of the compensation ‘tricks’ can increase the tar dose by many times the level displayed on the label and that these cigarette brands are capable of delivering the tar and nicotine of a full strength cigarette if the smoker wishes, consciously or subconsciously, to do it. Given that nicotine is powerfully addictive, smokers will tend to smoke in such a way that they achieve a satisfying smoke by compensating for the effects of the filter. The results show that Silk Cut Ultras are more dependent on the filter ventilation, and hence more susceptible to hole blocking. This is expected as they are designed to be very low tar when measured on the official smoking machine. Marlboro Lights rely relatively more on the retentive action of the filter which is not affected by hole blocking but would be undermined by deeper or more frequent puffs.

US regulator turns against its own creation

The approach of characterising cigarettes by smoking machine measurements has been used for many years by the US Federal Trade Commission. The FTC's approach was adopted by the International Standards Agency which has formalised standards for measurement. The FTC now accepts that this approach is not appropriate:

"We now know that the way a person smokes affects the amount of tar and nicotine they get. The present system does not reflect this." (FTC Press Release, Sept. 1997)⁷

Further studies of the test by the National Cancer Institute that found:

"the existing system does not accurately reflect actual human smoking behaviour, which varies widely among smokers, and that smokers who switch to lower tar and nicotine cigarettes may change their smoking behavior in ways that negate potential health benefits". (FTC letter November, 1998)⁸

The FTC summarised comments received from the FDA and NCI

"new data suggests that the limited health benefits, previously believed to be associated with lower tar and nicotine cigarettes, may not exist." (FTC Press Release, November, 1998)⁹:

On the strength of this and other evidence the FTC announced in November 1998 that it intends to carry out an 18 month review of the current system whilst running an advertising campaign advising consumers not to trust the tar and nicotine number. US Senator Lautenberg has also written to the FTC asking it to "begin a proceeding to suspend the right of tobacco companies to market cigarettes as "light" or "ultra light" until and unless an accurate system of measuring the health implications of cigarettes is established." (Nov 1998)¹⁰

Canadian tests show little difference between standard and low tar brands

In 1998, the Government of British Columbia introduced a requirement for disclosure of 48 smoke constituents, and measurements of cigarettes under varying smoking conditions. The first wave of tests on cigarettes sold in B.C. shows that under the "realistic smoking condition" which the smoking machine approximates, there is very little difference between 'light' and 'regular' cigarettes. Light cigarettes can even produce higher amounts of tar, nicotine and carbon monoxide than the regular cigarettes tested. This is also true of the other compounds found in cigarette smoke, like cadmium, benzo[a]pyrene, benzene, etc. [The results are available on the internet.](#)¹¹

Tar Values (mg/cig)	Values on Package	Standard ISO Test	"Realistic Smoking" Test
duMaurier King Size	15	15.2	36.9
duMaurier Light King Size	12	12.1	38.24
duMaurier Regular	13	14.4	33.6
Player's Regular	16	16.5	37.2
Player's Light King Size	13	13.7	33.3
Player's Extra Light Regular	11	11.8	31.4
Player's Light Regular	13	13.9	34.15
Matinee Extra Mild King Size	4	4.7	26
Rothmans King Size	15	15.8	34.2
Export A Regular	16	15	34
Export A Light Regular	13	13	28

British Columbia Ministry of health concludes... *Many smokers think that 'light' cigarettes are safer than regular cigarettes, and that by smoking 'light' cigarettes they will inhale fewer cancer-causing chemicals, or less nicotine. B.C.'s new smoking tests have shown how wrong this belief can be. The reports filed by the tobacco companies show that light cigarettes are likely to deliver as many (or more) poisons and toxins to smokers as regular cigarettes.*¹²

Health implications For some smokers of currently available brands in the UK there may be a small reduction in tar exposure by switching to low tar cigarettes, but the evidence suggests that health benefits are likely to be insignificant compared to giving up altogether. There is also evidence that compensation, by drawing smoke more deeply into the lungs, has led to a rise in adeno-carcinomas - a previously rare variety of lung cancer that afflicts the tiniest airways of the lungs. A 1997 study linked increased smoking of Light and Ultra Light cigarettes to adeno-carcinoma and showed that in the US, adeno-carcinoma increased 17-fold in women and 10-fold in men between 1959 and 1991¹³.

Consumer implications It is clear that the numbers displayed on cigarette packets are *worse than useless*. This is because they are widely (and rationally) interpreted as health information, when in fact they communicate misleading information. The effect is likely to be that genuine health concerns among smokers are being 'captured' by a switch to low tar cigarettes when the only real health option is to quit. On *No Smoking Day* (the second Wednesday in March), we hope many smokers will recognise that low tar cigarettes are at best a fool's paradise and at worst a con-trick and begin the process of giving up. Quitline provides free advice on giving up smoking on 0800 002200.

UK and EU political implications The maximum tar and nicotine yields of cigarettes are governed by an EU Directive¹⁴, which sets maximum tar levels, as measured by the ISO smoking machine, at 12 mg of tar per cigarette. An EU Directive also governs the labelling of cigarettes which includes display of tar and nicotine yields. It was agreed on 4th December 1997 in the Council of Health Ministers that both Directives would be examined by the European Commission, which would bring forward new legislative proposals to update the Directives - this gives an opportunity to rethink the whole area. It is clear that the machine measured yield is an inappropriate metric with which to characterise the harmful emissions of cigarettes, and that as consumer information it is actually dangerous and misleading. Yet it is still in universal use as consumer information. The key political questions are therefore:

- Why has this misleading consumer information been allowed to continue for so long and what should be put in its place?
- What would be an appropriate characterisation of cigarette smoke to reflect the harm caused to smokers and to give realistic, meaningful consumer information?
- What regulations could be put in place to control these characteristics and reduce the harmfulness of cigarettes?
- What role has the tobacco industry played in misleading consumers? This point is addressed more fully in Part 2.

Part 2: What the tobacco industry knew and how it behaved

What does the tobacco industry say? Internal tobacco industry documents released through US litigation show that the industry has well understood the compensation effect for at least twenty years. The documents show the industry has:

- Known for many years that low tar cigarettes offer consumers false reassurance.
- Understood the role of nicotine addiction in making smokers compensate to achieve a satisfactory dose of nicotine.
- Wrestled with the ethical implications of designing products that will register as low tar when measured on a smoking machine and reported on labels but will deliver high tar levels to the smoker - then gone ahead anyway.

It is clear from internal tobacco industry documents released as a result of litigation in the USA that the companies have understood 'compensation' for many years. The following paragraphs are extracts from tobacco industry documents that highlight the companies' thinking in this area.

BAT recognises nicotine is the basis of smoker behaviour and smokers as 'Pavlov's Dogs'...

"It is generally accepted that a large number of habitual smokers are influenced in their smoking habit by the amount of nicotine that they draw from a cigarette. Over a period of time, during which they are learning to smoke effectively - that is so they do not make themselves feel ill, but do derive pleasure and satisfaction from smoking - they probably build up an association in their minds between the mouth sensations such as flavour, irritation and "impact" and the amount of smoke that gives them the satisfaction of smoking. This is a similar mechanism to Pavlov's dogs."

(BAT Co., 1978)¹⁵

RJR recognise that 'compensation' means tar uptake will remain the same across a range of cigarettes

"The paper itself expresses what we in Biobehavioural have "felt" for quite some time. That is, smokers smoke differently than the FTC[Federal Trade Commission] machine and may very well smoke to obtain a certain level of nicotine in their bloodstream. If a given level of nicotine in the blood is the final goal of a smoker, one would predict that he would smoke an FFT(full flavour tar) and ULT (ultra low tar) cigarette differently.....This all falls under the area of smoker compensation which we have been interested in studying for some time now." (RJR 1983)¹⁶

BAT view smokers as constantly fighting nicotine withdrawal

"The smoker ... who smokes to maintain a constant blood level of nicotine is most likely trying to avoid the unpleasant sensations that he feels when he is not smoking. Without a cigarette he will become nervous, irritable and likely to make mistakes in his work. Such a smoker is likely to compensate for changed delivery if given a cigarette brand with different standard machine smoked deliveries to his usual brand so that as far as possible he maintains a constant blood level of nicotine." (BAT Co., 1978)¹⁷

Marlboro regular and lights smokers take up the same amount of smoke

"The smoker profile data reported earlier indicated that Marlboro Lights cigarettes were not smoked like regular Marlboros. There were differences in the size and frequency of the puffs, with larger volumes taken on Marlboro Lights by both regular Marlboro smokers and Marlboro Lights smokers. In effect, the Marlboro 85 smokers in this study did not achieve any reduction in the smoke intake by smoking a cigarette (Marlboro Lights) normally considered lower in delivery." **(Philip Morris 1975)¹⁸**

BAT defines 'compensation' in 1978...

Compensation may be defined as:- "Subconscious changes made to the smoking pattern by a smoker in an attempt, which may or may not be successful, to equalise the deliveries of products which have different deliveries when smoked by machine under standard conditions."

[...]"Numerous experiments have been carried out in Hamburg, Montreal and Southampton within the company, as well as many other experiments by research workers in independent organisations, that show that generally smokers do change their smoking patterns in response to changes in the machine smoked deliveries of cigarettes." **(BAT Co., 1978)¹⁹**

.....and recognises that its own evidence counters its own advice

"There is now sufficient evidence to challenge the advice to change to a lower delivery brand, at least in the short-term. In general, a majority of habitual smokers compensate for changed delivery, if they change to a lower delivery brand than their usual brand. If they choose a lower delivery brand which has a higher tar to nicotine ratio than their usual brand (which is often the case with lower delivery products), the smokers will in fact increase the amounts of tar and gas phase that they take in, in order to take the same amount of nicotine. More realistic advice to smokers would be to choose a brand with a lower tar to nicotine ratio which gives them the satisfaction that they require in the lowest amount of smoke taken in." **(BAT 1978)²⁰**

In private Philip Morris are honest about laboratory tar measurements

"I told him we do not make judgements on the relevance of tar to health I did, however, point out that measurement of tar yields, or indeed any smoke yields, under laboratory conditions bore no direct relationship to any individual's exposure to any substance." **(Philip Morris 1978)²¹**

And B&W design cigarettes to exploit smoker compensation

"Smoke Elasticity" - The elasticity of a cigarette is a measurement for the amount of smoke a smoker can take out of a cigarette.

"Which product/ design properties influence elasticity?
1. Tip ventilation: bigger effects at higher degree of ventilation.
2. Delivery of the blend."

(Brown & Williamson, 1984)²²

- ...but smokers should not know** "Compensation - It exists; most smokers practice it, but we need to understand it better before advantage can be taken in the marketplace. *Here, I believe designing to the subconscious is preferred to requiring the smoker to commit a conscious act.*" (Brown & Williamson, 1985 - italics added)²³
- BAT recognises there are no significant health gains from low-tar...** "It is difficult to ignore the advice of Health Authorities who advise smokers to give up smoking or change to a lower delivery brand but there is now sufficient evidence to challenge the advice to change to a lower delivery brand, at least in the short term. In general a majority of habitual smokers compensate for changed delivery, if they change to a lower delivery brand." (BAT Co., 1978)²⁴
- BAT recognises ethical dilemma and wrestles with its conscience...** "Should we market cigarettes intended to re-assure the smoker that they are safer without assuring ourselves that indeed they are so or are not less safe? For example should we 'cheat' smokers by 'cheating' League Tables? If we are prepared to accept that government has created league tables to encourage lower delivery cigarette smoking and further if we make league table claims as implied health claims - or allow health claims to be so implied - should we use our superior knowledge of our products to design them so that they give low league table positions but higher deliveries on human smoking?"
- "Are smokers entitled to expect that cigarettes shown as lower delivery in league tables will in fact deliver less to their lungs than cigarettes shown higher?" (BAT Co.,1977)²⁵
- ...but reaches the appropriate commercial conclusion!** "Elastic/ Compensatable Products - Irrespective of the ethics involved, we should develop alternative designs (that do not invite obvious criticism) which will allow the smoker to obtain significant enhanced deliveries should he so wish". (BAT Co., 1984)²⁶
- The "healthy" cigarette market beckons....** "Manufacturers are concentrating on the low TPM [tar] and Nicotine segment in order to create brands.....which aim, in one way or another, to reassure the consumer that theses brands are relatively more "healthy" than orthodox blended cigarettes" (BAT Co., 1971)²⁷
-but do not design a healthy cigarette.** "It was noted that we have very little data on the long-term consequences of smoking behaviour patterns following switching to low tar products... It was agreed that efforts should not be spent on designing a cigarette which, through its construction, denied the smoker the opportunity to compensate or oversmoke to any significant degree."(BAT,1981)²⁸
- ...low tar cigarettes needed to reassure** "All work in this area should be directed towards providing consumer reassurance about cigarettes and the smoking habit.

customers but keep them smoking

This can be provided in different ways, e.g. by claiming low deliveries, by the perception of low deliveries and by the perception of "mildness". Furthermore, advertising for low delivery or traditional brands should be constructed in ways so as not to provoke anxiety about health, but to alleviate it, and enable the smoker to feel assured about the habit and confident in maintaining it over time."
(BAT Co., 1977)²⁹

the industry encourages people to believe they are better for you

"People believe that cigarettes low in tar and nicotine have different "tobacco" ingredients and different kinds of filters than other cigarettes-the tobacco is milder or a special mild blend, perhaps treated to remove tar and nicotine, perhaps mixed with additives or fillers, perhaps cured differently-or maybe just more loosely packed...Those who smoke low tar and nicotine cigarettes generally do so because they believe such cigarettes are "better for you". (Lorillard,1976)³⁰

...and conceal what is really happening

"Compensatory smoking - This is also a particularly tricky subject. On the one hand it is commercially sensitive. On the other, it must be in the interest of the industry to get data and speak out against those who claim that the low delivery programme is misleading in that smokers compensate for the low deliveries."
(BAT Co.,1983)³¹

But there were early worries about where reducing nicotine might eventually lead

"On the question of nicotine and its effects on the smoker there can be two extreme forms of approach - (1) Keep up the nicotine content of cigarettes in order to maintain the, as yet, firmly entrenched nicotine habit. (2) Reduce the nicotine per cigarette.

To follow No. (2) too closely might end in destroying the nicotine habit in a large number of consumers and prevent it ever being acquired by new smokers. True, deprived of an increasing amount of nicotine per cigarette, consumers may tend to smoke more cigarettes, but this can only go on up to a point." (BAT Co., 1959)³²

After all, take out too much nicotine, and the cigarette is no longer viable?

"Goal - Determine the minimum level of nicotine that will allow continued smoking. We hypothesize that below some very low nicotine level, diminished physiological satisfaction cannot be compensated for by psychological satisfaction. At this point smoker will quit, or return to higher T&N brands."
(Lorillard US, 1980)³³

So keep pushing the nicotine...

"There is a danger in the current trend of lower and lower cigarette deliveries - i.e. the smoker will be weaned away from the habit. If the nicotine delivery is reduced below a threshold "satisfactory" level, then surely smokers will question more

readily why they are indulging in an expensive habit.

...worry about toxicity later... Looking further down the road... filters might offer a selective means of controlling smoke toxicity.

...and offer 'health reassurance' today Well before that date, however, opportunities exist for filter and cigarette designs which offer the image of "health reassurance" .
(BAT Co., 1976)³⁴

Low tar brand activity The UK cigarette market has seen many new low and ultra low tar brands introduced in 1999. Most major brands now have a light variant. Lambert and Butler, Benson and Hedges 'Mellow', Embassy, Regal, Camel, Marlboro all now have lights or ultra-lights varieties.

Recent low tar advertising The tobacco companies have promoted 'Light' and 'Low' products with the clear implication that they are somehow less harmful for many years. Silk Cut Ultras were heavily advertised prior to New Year 1998, and again for 1999, using the slogan "JAN ONE - What better time to move to 1 mg"³⁵. The 'ONE' refers to the 1mg tar measured in the Silk Cut Ultra - which has been the theme of a campaign using several slogans involving 'ONE'. The 'JAN ONE' advert was clearly intended to suggest that switching to Silk Cut Ultra was a worthy New Year's resolution - effectively an unfounded health claim.

Implications for tobacco advertising As the European Union has decided to ban tobacco advertising, tobacco industry pressure groups such as FOREST have argued that tobacco advertising is necessary in order to inform smokers of new products such as low tar cigarettes. According to FOREST:

We have seen the development of filter-tipped cigarettes, low and ultra-low tar cigarettes, cigarettes containing lower levels of nicotine, menthol cigarettes and herbal cigarettes containing no nicotine. These developments address some of the concerns of the medical profession about tar and nicotine and consumers' own preferences on taste. What would have been the point of tobacco companies investing in developing new products if they could not inform customers about them?

(FOREST, 1997)³⁶

The case for a tobacco advertising ban is further strengthened by the history of marketing low tar cigarettes.

CONCLUSION The documents are an indictment of an industry that has deliberately designed and marketed products offering bogus health reassurance. It has understood, but continues to deny publicly, the central role of nicotine addiction in its business and therefore is fully aware that the marketing of low tar cigarettes is a deliberate deception of smokers.

Notes and References

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- ³ Benowitz NL, Hall SM, Herning RI, et al. Smokers of low-yield cigarettes do not consume less nicotine. *New England Journal of Medicine* 1983;309(3):139-142.
- ⁴ ISO 3308, 3402, 4387, 10315, 10362-1 (all 1991) and ISO 8454 (1995).
- ⁵ Darrall KG, Figgins JA: *The Blocking of Cigarette Filter Ventilation Holes*, Laboratory of the Government Chemist Report EH40/M007/98
- ⁶ Kozlowski LT, Pope MA, Lux JE. *Prevalence of the Misuse of Ultra-Low-Tar Cigarettes by Blocking Filter Vents*, *American Journal of Public Health*, June 1988 Vol. 78, No 6.
- ⁷ Jodie Bernstein, Director of the Bureau of Consumer Protection, FTC press release, September 9th 1997.
- ⁸ FTC letter to Donna Shalala, Secretary, Department of Health and Human Services. November 19th 1998.
- ⁹ FTC Press Release, FTC Statement in response to Senator Frank Lautenberg's letter, November 24th 1998.
- ¹⁰ Letter from US Senator Lautenberg to FTC, November 24th, 1998.
- ¹¹ See British Columbia Ministry of Health web site: <http://www.cctc.ca/bcreports/default.htm>
- ¹² British Columbia Ministry of Health, December 1998. See web site above.
- ¹³ *Journal of the National Cancer Institute*, November 1997.
- ¹⁴ 90/239/EEC
- ¹⁵ David Creighton BAT Co. *Compensation for Changed Delivery*, 27th June, 1978. Source: Minnesota Trial Exhibit 11,089
- ¹⁶ Robinson JH. Critique of smokers of low yield cigarettes do not consume less nicotine. To A. Rodgman, RJR, July 25, 1983. Trial exhibit 12648.
- ¹⁷ Op cit. Trial Exhibit 11,089
- ¹⁸ Goodman B. Marlboro Lights study delivery data. Report to L.F.Meyer, Philip Morris, September 17, 1975. Trial Exhibit 11564
- ¹⁹ Op cit. Trial Exhibit 11,089
- ²⁰ Creighton DE. Compensation for changed delivery. BAT, June 27, 1979 Trial Exhibit 11089.
- ²¹ Philip Morris, September 1978, Tobacco Resolution ID 2025022663/2667
- ²² Brown and Williamson, Proceedings of the smoking behaviour marketing conference July 9th-12th 1984 Session III. Minnesota Trial Exhibit 13,431
- ²³ Sandford R.A., internal memorandum to EE Kohnhorst, Brown & Williamson, Research Development and Engineering. 28th June 1985. Minnesota Trial Exhibit 13,250
- ²⁴ Op cit. Trial Exhibit 11,089
- ²⁵ BAT Co. *Suggested Questions for JH CAC.III*, 26th August 1977. Minnesota Trial Exhibit 11,390.
- ²⁶ BAT Co. *R&D views on potential marketing opportunities*. 12th September 1984. Minnesota Trial Exhibit 11,275.
- ²⁷ Short P.L., BAT Co. *A New Product*. 21st October 1971. Minnesota Trial Exhibit 10,306.

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- ²⁸ BAT, May 19, 1981. Trial Exhibit 11357
- ²⁹ Short P.L., BAT Co. Smoking and Health Item 7: the Effect on Marketing. 14th April 1977. Minnesota Trial Exhibit 10,585.
- ³⁰ Lorillard, December 1976. Trial Exhibit 17994
- ³¹ Blackman L.C.F., (BAT Co.) *Notes of a Meeting of Tobacco Company Research Directors*, Imperial Head Office, 16th February 1983. Minnesota Trial Exhibit 11,259. (Note that this suggests much of what was known to BAT was known to the other companies.)
- ³² BAT Research & Development, Complexity of the P.A.5.A. machine and variables pool. 26th August 1959. Minnesota Trial Exhibit 10,392.
- ³³ Smith R.E., Internal memorandum - SECRET. To: JR Ave, JG Flinn, AW Spears. Lorillard Co. (US) 13th February 1980. Minnesota Trial Exhibit 10,170.
- ³⁴ BAT Co. The Product in the Early 1980s. 25th March 1977. Minnesota Trial Exhibit 11,386.
- ³⁵ For example in *The Guardian*, 27th December 1997; *The Times*, 29th December 1997.
- ³⁶ Discrimination or Accommodation: the consequence of anti-smoking policies on 15 million consumers, FOREST, July 1997.