Toward a Less Fire-Prone Cigarette

Technical
Study Group
Cigarette Safety
Act of 1984

October 1987

Final Report of the Technical Study Group on Cigarette and Little Cigar Fire Safety

Mission and Members

The Technical Study Group on Cigarette and Little Cigar Fire Safety was established by Public Law 98-567, the Cigarette Safety Act of 1984, on October 30, 1984. Its mission is to:

"undertake such studies and other activities as it considers necessary and appropriate to determine the technical and commercial feasibility, economic impact, and other consequences of developing cigarettes and little cigars that will have a minimum propensity to ignite upholstered furniture or mattresses. Such activities include identification of the different physical characteristics of cigarettes and little cigars which have an impact on the ignition of upholstered furniture and mattresses, an analysis of the feasibility of altering any pertinent characteristics to reduce ignition propensity, and an analysis of the possible costs and benefits, both to the industry and the public, associated with any such product modification."

Copies of this or any other reports of the Technical Study Group may be obtained from Mr. Colin B. Church, Secretariat, Technical Study Group, Consumer Product Safety Commission, 5401 Westbard Avenue, Washington, D.C., 20207.

MEMBERS:
Richard G. Gann, Ph.D., Chairman
Edward Press, M.D., Vice-Chairman
Charles M. Carey
James L. Charles, Ph.D.
Joseph W. Cullen, Ph.D.
John C. Gerard
James F. Hoebel
Preston H. Leake, Ph.D.
Michael D. McGibeny
Andrew McGuire
Wendy H. Poel
Alexander W. Spears, III, Ph.D.
Henry Tovey
David E. Townsend, Ph.D.
Judith P. Wilkenfeld, Esq.

PAST MEMBERS:
Howard Beales, III
Harry I. Cohen
Craig G. Drummond
Max Hausermann, Ph.D.
Alan Rodgman, Ph.D.

Toward a Less Fire-Prone Cigarette

Technical
Study Group
Cigarette Safety
Act of 1984

October 1987

Final Report of the Technical Study Group on Cigarette and Little Cigar Fire Safety

[redacted]

We, the undersigned members of the Technical Study Group on Cigarette and Little Cigar Fire Safety, approve our final technical report

Toward a Less Fire-Pront Cigarette

for transmittal to the Interagency Committee for submission to the Congress.

Richard G. Gann, Ph.D.
Chairman

Edward Press, M.D.
Vice-Chairman

Michael D. McGibeny

Charles M. Carey

Andrew McGuire

James L. Charles, Ph.D.

Wendy H. Poel

Joseph W. Cullen, Ph.D.

Alexander W. Spears, III, Ph.D.

John C. Gerard

Henry Tovey

James F. Hoebel

David E. Townsend, Ph.D.

Preston H. Leake, Ph.D.

Judith P. Wilkenfeld, Esq.

Contents

List of Tables

List of Figures

Executive Summary

The Cigarette Safety Act of 1984 created the Technical Study Group on Cigarette and Little Cigar Fire Safety (TSG), directing it to "undertake such studies and other activities as it considers necessary and appropriate to determine the technical and commercial feasibility, economic impact, and other consequences of developing cigarettes and little cigars that will have a minimum propensity to ignite upholstered furniture or mattresses." Less ignition-prone cigarettes would significantly reduce fire losses. Since its formation in January, 1985, the TSG has carried out a program of consultation, deliberation, and research. This text is the final report on that program.

The Technical Study Group finds that it is technically feasible and may be commercially feasible to develop cigarettes that will have a significantly reduced propensity to ignite upholstered furniture or mattresses. Furthermore, the overall impact on other aspects of the United States society and economy may be minimal. Thus it may be possible to solve this problem at costs that are less than the potential benefits, assuming the commercial feasibility of the modified cigarettes.

The particular conclusions of this study are as follows:

- There are cigarette characteristics whose variations in the laboratory reduced the ignition propensity of the cigarette. These are: reduced circumference, lower density tobacco, less porous paper, and reduction of citrate addition to the paper. Considerably larger reductions were achieved with combinations of these. Several patented approaches also offer directions for further investigation. Limited evidence suggests the presence of a filter may also have some effect on ignition propensity.

- The differences in ignition propensity among selected current commercial cigarettes are unimportant.

- Measurements of cigarette ignition propensity on upholstered furniture mockups are reasonable indicators of performance on full-scale furniture made of the same materials. However, the wide lot-to-lot variation in those materials limits the use of such mockups for cigarette testing over a long period of time and by different laboratories.

- A valid and reliable measurement method is needed to determine that a cigarette is less ignition-prone. It is also important to collect information on cigarette-initiated fires to determine how successfully future cigarettes perform.

- The manufacture of less fire-prone cigarettes may require some advances in cigarette design and manufacturing technology.

- No cigarettes were tested for their acceptability to the smoking public. However, some physical characteristics which decrease a cigarette's propensity to ignite soft furnishings are incorporated individually in some commercial cigarettes. Combinations of all characteristics of the lowest ignition propensity cigarettes have not been incorporated in any commercial cigarettes.

- The overall effects of the cigarette modifications considered may result in only small changes in the price of cigarettes, unemployment, health care costs, life expectancy, and the financial status of the affected industries and professions. This conclusion involves a number of broad but necessary assumptions.

- The per puff tar, nicotine, and carbon monoxide yields from some of the least ignition-prone experimental cigarettes were within the ranges of yields from the best-selling commercial cigarettes. These cigarettes have a significantly higher resistance to puffing and a marginally lower number of puffs than do current commercial cigarettes. The toxicity of smoke from a future low ignition propensity cigarette needs to be addressed, as would the smoke from any substantially modified commercial cigarette, before its introduction into the marketplace.

The Technical Study Group recommends the following technical activities be pursued:

- A standard test method is needed to determine cigarette ignition propensity. Such a method should be developed as soon as possible and validated using the current set of experimental cigarettes.

- Performance data for current market cigarettes should be generated using the new test method. These data could then be compared to future year cigarette performance.

- A study to collect baseline and follow-up data about the characteristics of cigarettes, products ignited, and smokers involved in fires should be designed and implemented.

- Systematic knowledge should be developed (from existing or new sources, as appropriate) on (a) changes in the toxicity of smoke and resultant health effects from modified cigarettes, and (b) societal costs of injuries from cigarette-initiated fires.

- Both the laboratory studies on and computer modeling of ignition physics should be continued to develop a valid, user-friendly predictive capability. This would enable inexpensive screening for ignition propensity of future cigarette concepts. (The authors of reference 19 have offered more detailed recommendations for further research.)

Introduction

United States Fire Loss Profile

The fire loss record in the United States is among the worst in the industrialized world. In 1984, there were 5,400 civilian and fire fighter deaths, 130,000 serious injuries, and a direct property loss of $6.7 billion resulting from 2.3 million reported fires.[1,2,3] The Nation's total annual cost of fire was nearly $40 billion.[4] The fire death rate is double that of most countries on a per capita basis.[5] The numbers of fires and casualties, which declined over the last decade, now appear to have levelled off from 1982 to 1985.[6]

Cigarette ignition of upholstered furniture and mattresses is by far the leading cause of fire deaths. For the 600 billion cigarettes sold annually [7], the probability of one being dropped, igniting these soft furnishings and leading to a death or injury is small. Yet in 1984, 67,000 cigarette-initiated fires resulted in 1,570 deaths, 7,000 serious injuries, and $390 million of destroyed property.[8] These most often happened in residences when a lit cigarette was dropped onto bedding or an upholstered chair. The fabric and/or padding smoldered slowly, and often then burst into flames. The victims succumbed either to burns or to inhaled toxic smoke.[9] Cigarettes are involved in a constant percentage of all fire deaths [10] and thus are a continuing threat to our society.

For nearly two decades, efforts have been devoted to reducing the susceptibility to cigarette ignition of both upholstered furniture and mattresses (soft furnishings). A mandatory standard for mattresses [11] and voluntary standards for upholstered furniture [12,13] have resulted in the manufacture of less readily-ignited soft furnishings. Yet, even these highly-productive efforts are not enough to end the losses from cigarette-initiated fires quickly. These commodities have average lifetimes of about fifteen years [14], so the full impact of the improved furniture and mattresses on fire safety will not be realized for decades to come. Moreover, the risk of death per fire is increasing.[10] By contrast, cigarettes are consumed within a few months of their production [15], leading to the possibility that fire deaths and injuries could be reduced sooner if the cigarette were suitably modified.

The Cigarette Safety Act of 1984

To guide possible legislative action on the prevention of cigarette-initiated fires, Public Law 98-567, the "Cigarette Safety Act of 1984," was passed by the 98th Congress and signed into law on October 30, 1984. The Act established an Interagency Committee (IAC) to provide appropriate policy recommendations based on the work of a Technical Study Group on Cigarette and Little Cigar Fire Safety (TSG). The TSG was directed to:

> "undertake such studies and other activities as it considers necessary and appropriate to determine the technical and commercial feasibility, economic impact, and other consequences of developing cigarettes and little cigars that will have a minimum propensity to ignite upholstered furniture or mattresses.
>
> Such activities include:
>
> identification of the different physical characteristics of cigarettes and little cigars which have an impact on the ignition of upholstered furniture and mattresses,
> an analysis of the feasibility of altering any pertinent characteristics to reduce ignition propensity, and
>
> an analysis of the possible costs and benefits, both to the industry and the public, associated with any such product modification."

The full text of the Act appears as Appendix A. The TSG chose not to study little cigars, since they accounted for only about 0.2% of sales [16] and all cigars accounted for less than 1% of *all* fires and fire deaths [8].

The approach of the TSG included research with a range of fabric and padding materials and systematically-varied (experimental), as well as commercial, cigarettes. Existing economic, mathematical, and computer modeling methods were used where possible and adapted as needed. Extensive use was made of experts in the various fields of concern to supplement the knowledge of the TSG members and to support the work of its contractors. The technical reports resulting from this research are listed as references [8,17-27] and accompany this document.

A roster of the TSG members and their affiliations appears as Appendix B. A chronology of TSG meetings is included as Appendix C. All meetings of the TSG were announced in the *Federal Register* and, except for one brief period where industry-confidential material was discussed, were open to the public. The TSG initial and refined work plans appear as Appendices D and E. With the exceptions noted later, the IAC approved the TSG plans. The cost of this program was 2.1 million dollars.

This report now continues with the findings of the TSG under the three charges in the Act.

Technical Feasibility,[1]

Including the Identification of the Different Physical Characteristics of Cigarettes and Little Cigars Which Have an Impact on the Ignition of Upholstered Furniture and Mattresses

Background Knowledge

A cigarette is a cylinder (column) of tobacco strips wrapped in paper, usually with a filter tip at one end. A cigarette can be characterized by the type of tobacco, the density of that tobacco in the column, the length and circumference of that column, the thickness and porosity of the wrapping paper, and any additives to either the tobacco or the paper. The tobacco density may be decreased by expanding the volume of the tobacco strands or by cutting them wider. Citrates are conventionally added to the paper to produce an even, clean-appearing burn.

Cigarette ignition of furniture occurs when the burning cigarette heats the furniture fabric or padding to the point where it begins to smolder. (Figure 1) Therefore, a less ignition-prone cigarette must generate less heat (i.e., burn less fuel or restrict access of oxygen to the fuel), or heat the fabric less efficiently.

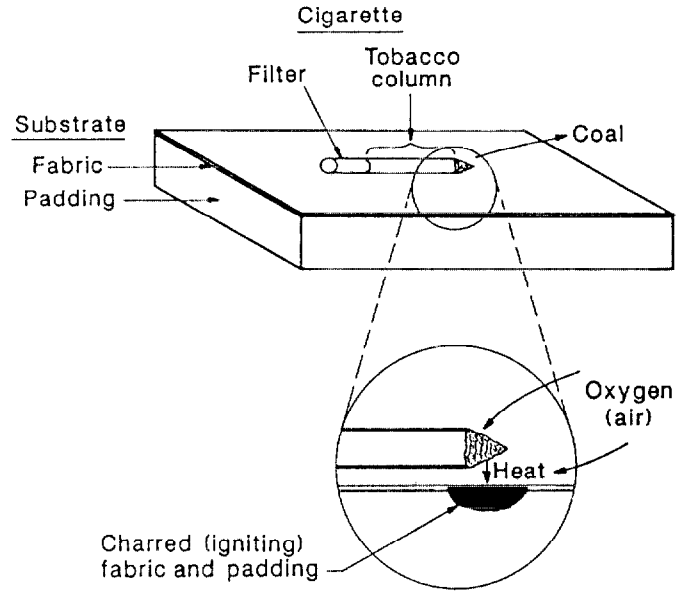
A literature search, conducted by the National Bureau of Standards' Center for Fire Research (NBS-CFR) showed little information relating the cigarette's characteristics to the propensity of the cigarette to ignite substrates.[2][17] Most earlier studies were of cigarettes burning while suspended in air, often while being puffed. This differs markedly from cigarettes dropped onto furnishings.

A few laboratory studies did find differences in the ignition propensities of some commercial or experimental cigarettes on selected substrates. These suggested that some combinations of cigarette properties might lead to less ignition-prone cigarettes.[17]

[1] *Technical feasibility addresses whether cigarettes with reduced ignition propensity can be created.*

[2] *The term "substrate" is used to mean a piece of upholstered furniture, a mattress, or a laboratory mockup of one of these. It means one combination of a specific fabric and padding, in either a flat or crevice configuration, with or without a cover sheet. (The cover sheet simulates, e.g., a sheet pulled over the real-life dropped cigarette.) For example, one substrate would be the flat area of a piece of polyurethane foam covered with an olefin fabric, with the cigarette covered by sheeting. The flat area with the same materials, but with the cigarette not covered would be a different substrate.*

Figure 1. Cigarette Ignition of Upholstered Cushion



Small-Scale Tests

An inexpensive, rapid procedure was adopted for evaluating a variety of test cigarettes. The reduced-scale mockups of furniture (Figure 2) that were used also provided a link to the bulk of previous testing of this ignition process. Fabrics and padding materials were selected to represent furniture having a range of susceptibility to cigarette ignition. These included some of the most ignition-prone materials available. The ignition criterion used was a clear appearance of ignition, confirmed by a significant weight loss of the cigarette/substrate assembly.

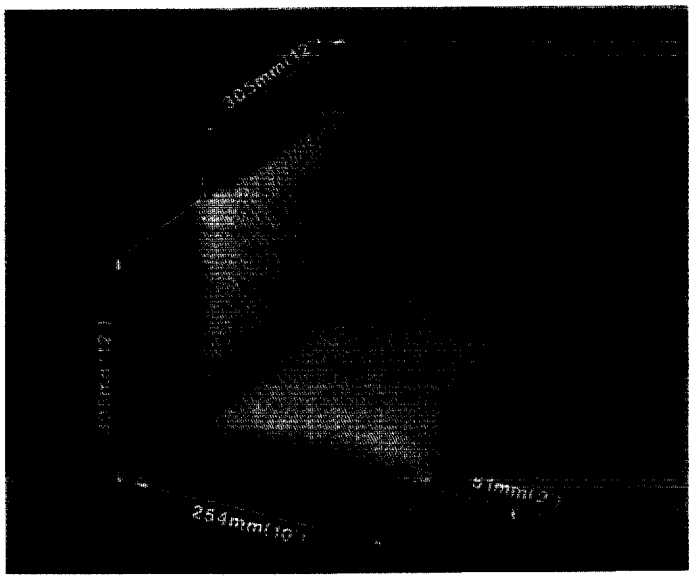
The TSG first looked at whether a solution already existed to the ignition problem among existing cigarettes. Twelve

Table 1. Description of Experimental Cigarettes

No.	Tobacco	Tobacco Density	Paper Porosity	Citrate Added	Circum-ference (mm)	Second Paper Wrapping[c]
101	Burley	High	Low	Yes	21	No
102	Burley	High	Low	No	21	No
103	Burley	High	High	Yes	21	No
104	Burley	High	High	No	21	No
105	Burley	Low	Low	Yes	21	No
106	Burley	Low	Low	No	21	No
107	Burley	Low	High	Yes	21	No
108	Burley	Low	High	No	21	No
109	Flue-Cured	High	Low	Yes	21	No
110	Flue-Cured	High	Low	No	21	No
111	Flue-Cured	High	High	Yes	21	No
112	Flue-Cured	High	High	No	21	No
113	Flue-Cured	Low	Low	Yes	21	No
114	Flue-Cured	Low	Low	No	21	No
115	Flue-Cured	Low	High	Yes	21	No
116	Flue-Cured	Low	High	No	21	No
117	Burley	High	Low	Yes	25	No
118	Burley	High	Low	No	25	No
119	Burley	High	High	Yes	25	No
120	Burley	High	High	No	25	No
121	Burley	Low	Low	Yes	25	No
122	Burley	Low	Low	No	25	No
123	Burley	Low	High	Yes	25	No
124	Burley	Low	High	No	25	No
125	Flue-Cured	High	Low	Yes	25	No
126	Flue-Cured	High	Low	No	25	No
127	Flue-Cured	High	High	Yes	25	No
128	Flue-Cured	High	High	No	25	No
129	Flue-Cured	Low	Low	Yes	25	No
130	Flue-Cured	Low	Low	No	25	No
131	Flue-Cured	Low	High	Yes	25	No
132	Flue-Cured	Low	High	No	25	No
201	Flue-Cured	Low	Very Low	No	21	No
202	Flue-Cured	Low	Very Low	No	25	No
203	Flue-Cured	Low	Very Low[a]	No	25	No
204	Flue-Cured	Low	Very Low[b]	No	25	No
205	Flue-Cured	Low	Very Low[a,b]	No	25	No
206	Flue-Cured	Low	Very Low	No	25	Yes
207	Flue-Cured	Low	Very Low[a]	No	25	Yes
208	Flue-Cured	Low	Very Low[b]	No	25	Yes
209	Flue-Cured	Low	Very Low[a,b]	No	25	Yes

[a]Electrostatically perforated to "high" permeability after manufacture.
[b]Embossed (to separate the burning tobacco from the substrate)
[c]Two paper layers; inner wrap is extremely porous.

Figure 2. Furniture Mockup for Ignition Testing



commercial cigarette packings[3] were chosen that fit the following criteria: (a) high, low, or middle expected ignition propensity; and/or (b) large market share. The cigarettes were supplied gratis to the NBS-CFR by their manufacturers without brand identification. With much difficulty, NBS-CFR found fabric-padding combinations that would differentiate among the ignition propensities of the twelve cigarettes. Cigarettes were tested in both the flat and crevice configurations, both covered and uncovered by a cloth sheet.[18] **The results indicated that the differences in ignition propensity among current commercial cigarettes are unimportant.**

To identify which cigarette characteristics could reduce ignition probability, 41 types of experimental cigarettes were obtained whose properties were varied one at a time. The properties included tobacco density, tobacco type, circumference, paper porosity, number of paper layers, and paper burning additive (sodium/potassium citrate). Two values of each of these properties were selected. All of the cigarettes were 100 mm long with filter tips. Variation of the length or removal of the filter was achieved by cutting off one end. The properties of the 41 cigarette types are summarized in Table 1. The cigarettes were manufactured (at no cost to the TSG) by the cigarette industry mostly on commercial equipment operated under less than production conditions. Those with double-wrapped or embossed paper were made using research equipment. Independent laboratories determined that each cigarette type was as ordered and of little variance. The cigarettes' tar, nicotine, and carbon monoxide yields were determined by the Federal Trade Commission, as well as by the cigarette industry. The two sets of results were in excellent agreement. Both sets of data showed marginally lower than normal puff counts; the industry data also showed a higher than normal resistance to puffing. The properties of these cigarettes are described more fully in Chapter 2 of reference 19.

Each of these cigarette types were tested for ignition performance on a variety of substrates. These fabric/padding/geometry combinations represented commonly in-use and both intermediate and easy to ignite furnishings. The resulting fractions of ignitions were compared with each other and with similar data for representatives of the commercial cigarettes. (Table 2)

Table 2. Ignition Propensities of Selected Test Cigarettes [19]

	Designation	No. Ignitions in 20 Tests	%
Experimental Cigarettes	201	0	0
	106	1	5
	202	2	10
	130	4	20
	114	4	20
	105	6	30
	113	6	30
	108	7	35
	122	7	35
	129	10	50
	107	11	55
	120	20	100
	127	20	100
Least Ignition-Prone Commercial Cigarettes	2	12	60
	1	16	80
Typical Ignition Propensity Commercial Cigarettes	3	18	90
	6	20	100

The data show a wide range of ignition propensities. Many of the cigarettes burned their entire length without igniting the substrate. **Several of the experimental cigarettes performed distinctly better than their peers or the commercial cigarettes, even on the easiest-to-ignite substrates.**[19]

Table 3 summarizes the results by cigarette property.

[3] *A cigarette packing is defined as a commercial cigarette, described by its name, its diameter, its length, whether menthol or non-menthol, whether filter or non-filter, and by its package type (e.g., soft pack).*

Several properties reduce the likelihood of ignition: low tobacco density, small circumference, low paper porosity, and in some cases elimination of citrate addition to the paper. Considerably larger reductions were achieved with combinations of these properties. Within the limits tested, the tobacco type had little effect.[19] Because only two values of each property were studied, the effect on ignition propensity of intermediate or more extreme values of those properties is unknown.

Table 3. Ignition Propensity as a Function of Cigarette Characteristics [19]

Cigarette Parameters	Number of Ignitions/ Tests	Ignitions
Tobacco Density		
High	282/320	88
Low	153/320	48
Cigarette Circumference (mm)		
25	243/320	76
21	192/320	60
Paper Porosity		
High	256/320	80
Low	179/320	56
Paper Citrate Conc. (%)		
0.8	231/320	72
0.0	204/320	64
Paper Citrate Conc. (%) (Low Ignition Propensity Cigarettes)		
0.8	47/100	47
0.0	23/100	23
Tobacco Type		
Flue-cured	222/320	69
Burley	213/320	66

Testing, on only one substrate, of seven of these experimental cigarettes with the filters removed showed some increase in ignition propensity.[19] No such difference between filter and non-filter commercial cigarettes was found.[18] However, only in the experimental cigarettes were all other features of the cigarette held constant.

During the last century, approximately one hundred patents have been issued for claims of fire-safe cigarettes. The TSG decided to examine some of these for potential effectiveness. Accordingly, notices were placed in the *Federal Register* (Appendix F) requesting patent holders to submit the single best embodiment of their ideas, along with identical cigarettes without the patented feature (controls). A total of five such submissions was made from four sources. The cigarettes were coded immediately upon receipt. The submitters have been notified of the code for their cigarettes only, and the code has since been destroyed.

The five patented design features, as provided by the patent holders, were:

- Very low porosity, high weight paper with a high citrate level, then electrostatically perforated to a high porosity;
- Sodium silicate added to 5 mm in the center of the tobacco rod;
- Two 6.5 mm bands, 15 mm apart, of low porosity paper attached at fixed intervals to the inside surface of the cigarette wrapper, which has a medium porosity and 0.8% sodium potassium citrate (sic);
- Application to the exterior surface of a water suspension containing non-fat dry milk and mono-ammonium phosphate; and
- Addition to the tobacco column of an intumescent silicate.

All these cigarettes and their controls were tested in the same manner as the cigarettes above, including some more ignition-prone substrates. **All five of the patented cigarettes showed distinct improvement over their submitted controls (Table 4) and the typical current commercial cigarettes.**[19]

Table 4. Ignition Propensities of Patented Cigarettes [19]

Cigarette Designation	No. Ignitions/ No. Tests	Percent Ignitions
301-Control	25/25	100
301	29/50	58
302-Control	24/25	96
302	10/50	20
303-Control	25/25	100
303	32/60	53
304-Control	25/25	100
304	33/50	66
305-Control	25/25	100
305	13/60	22

Neither the patented cigarettes nor their submitted controls were analyzed to verify their composition. Therefore, their measured effectiveness may not have the same validity as the results on the experimental cigarettes. Nonetheless, **the TSG feels that the concepts embodied in these patents offer promising directions for pursuit, despite some concerns about the difficulty of mass manufacturing such cigarettes and possible adverse changes in the toxicity of the smoke.**

A computer model of the smoldering combustion of a cigarette and the response of an idealized substrate was devised [19] to screen future combinations of characteristics for their effect on ignition. To guide the model and to identify the right input data, the ignition process was studied in depth.[19] This included measuring the temperature and energy flux while cigarettes smoldered on different substrates. Infrared imaging was used to map the temperature of the substrate.

Ignition was found to depend on both the cigarette and the substrate. Therefore, an accurate ignition propensity model and measurement apparatus must involve the two components. Important features include the area of the cigarette's burning coal, the smolder velocity of the cigarette, and the heat absorbance of the substrate. By contrast, oxygen depletion in the fabric does not vary with the ignition propensity of the cigarette.

The prototype computer program, with all its simplifications, is sufficiently realistic to (1) calculate the most important and most sensitive physical features of the ignition process and (2) reproduce some of the cigarette characteristics that do and do not affect ignition propensity. At present, however, the model is very slow, expensive to run, and not user-friendly.

Validity of Small-Scale Test Data

Reduced-scale flammability test results need to be checked using full-scale items to assure the accuracy of the tests. Two such comparisons with full-scale data were performed. In the first, NBS-CFR tested chairs made of the same materials as the mockups using some of the best and worst experimental cigarettes and commercial cigarettes. (Table 5) The furniture was supplied by the furniture industry (Upholstered Furniture Action Council and the Business and Institutional Furniture Manufacturers Association) at no cost to the Technical Study Group.

There is a strong, but not perfect, correlation (coefficient = 0.86) between the mockup and chair data.[19]

In a second series, the California Bureau of Home Furnishings (BHF) tabulated data on a hundred pieces of furniture and mockups made from those pieces; one commercial cigarette was used.[20] In over 90% of the cases where ignition occurred with the mockup, ignition also occurred on the chair.

The TSG concludes that mockup measurements are a reasonable indicator of the performance of full-scale furniture made of the same materials. In addition, the mockup measurements are a good screening tool for low ignition propensity cigarettes.

Table 5. Comparison of Ignition Propensities of Tested Cigarettes at Full- and Reduced-Scales [19]

Cigarette Number	Percent Ignitions	
	Bench-Scale	Full-Scale
6	74	73
129	13	23
114	6	14
106	3	6
201	0	6

To check the repeatability of the mock-up measurements, sample cigarettes and substrate materials were shipped by the NBS-CFR to the BHF for testing using the same procedure. The first of the two substrates was moderately easy to ignite; the second was one of the easiest. Table 6 shows the results of those tests.

The interlaboratory agreement is excellent. **The TSG concludes that, with careful control of materials and testing procedures, test results can be reproduced in different laboratories.**

The combined results from these studies demonstrate the importance of the following properties in reducing the ignition propensity of cigarettes: low tobacco density, small circumference, low paper porosity, and in some cases elimination of citrate addition to the paper.

Table 6. Interlaboratory Comparison of the Number of Ignitions for Various Cigarettes and Substrates [19,20]
(flat surface/uncovered cigarettes; 5 tests each)

Cigarette Number	Cotton Batting California Fabric		Polyurethane Foam Splendor Fabric	
	CFR	BHF	CFR	BHF
3	5	5	5	5
102	2	1	5	5
105	0	0	3	4
106	0	0	1	1
108	3	4	4	5
114	1	2	3	0
118	5	4	5	5
122	3	4	2	3
126	5	5	5	5
201	0	0	0	0

Commercial Feasibility,[4]

Including Analysis of the Feasibility of Altering Any Pertinent Characteristics to Reduce Ignition Propensity

Manufacturing Feasibility

Most of the experimental cigarettes were manufactured on current hardware at reduced production rates. Many of their features have been incorporated individually in commercial cigarettes. Therefore, no *fundamental* changes in cigarette manufacturing are needed to produce some types of less ignition-prone cigarettes. However, there are a number of barriers that need to be overcome to produce them in sufficient quantity to meet current demand. The patented additives and the special papers appear to require more severe modifications to the manufacturing process. The current limitations, as presented by the cigarette industry, are:

- Insufficient manufacturing capacity to produce enough cigarettes at the slower rates used for the experimental cigarettes;
- Inadequate supply of expandable tobacco;
- Limits as to how far the packing density of current tobacco blends can be reduced; and
- Need for new processing technology for inclusion of any new additives to the tobacco or paper.

Consumer Acceptance

The experimental cigarettes tested by the TSG were designed to have wide ranges of physical characteristics. While the best of these showed significant reduction in ignition propensity, the represented cigarette manufacturers state that all of these cigarettes have one or more characteristics that will make them difficult to sell; for example:

- Excessive resistance to puffing;
- Offensive taste or aroma;
- Unusual size or appearance;
- Difficulty of lighting the cigarette or keeping it lit;
- Higher price;
- Reduced number of puffs;
- Changed tar and nicotine yield;
- Collapse of the partially-smoked cigarette; and
- Dropping of hot embers.

Certainly, a range of variations are possible on the few indicative samples of experimental cigarettes tested in this program. This project has identified a variety of fire safety factors to be added to the "equation" for cigarette design.

The TSG has not tested any cigarettes for acceptability to the smoking public. However, some physical characteristics which decrease a cigarette's propensity to ignite soft furnishings are incorporated individually in some commercial cigarettes. The combination of all the characteristics of the lowest ignition propensity cigarettes have not been incorporated in any commercial cigarettes.

Monitoring Ignition Propensity

A valid and reliable test method is needed to measure the reduced ignition propensity of improved cigarettes. Accordingly, the Technical Study Group commissioned both analysis and laboratory trials of several proposed approaches for potential standardized test methods for cigarette ignition propensity.

The TSG concludes that the current mockup method is usable for research measurements of the relative ignition propensity of cigarettes. However, because of the lot-to-lot variability of the fabrics and paddings used, this method should not be used as the standard test method.

None of the several alternative candidate test methods for measuring the cigarette ignition propensity of soft furnishings was usable in its current state of development. Two approaches to cigarette testing are proposed. The first modifies the existing mockup procedure using specially-prepared, well-controlled fabrics and paddings. The second uses a non-reactive substrate at variable temperature to determine the minimum needed cigarette heat-loss rate for extinguishment. Both need further development.[19]

It is also important to characterize the cigarettes involved in cigarette-initiated fires over a period of time

[4] *Commercial feasibility addresses whether the cigarettes can be economically manufactured in sufficient quantity to meet consumer demand and whether smokers will buy them.*

to determine how successfully the modified cigarettes have performed. A pilot study was conducted by the Consumer Product Safety Commission (CPSC) staff to assess the feasibility of identifying critical contributing factors in cigarette-initiated fires: the kinds of cigarettes involved (and their physical characteristics), the furnishings ignited, and characteristics of the smokers.[21] Working with the International Association of Fire Chiefs, fire incidence data were collected by nine fire departments. Data on the physical characteristics of virtually all 247 current cigarette packings were obtained from the manufacturers to allow determination of the importance of cigarette physical property factors in the fires.

In the ten weeks of the project, 100 cases were reported. This is about half of these fires expected from the nine cities. A positive identification of the cigarette packing was obtained in 59 of these. In most cases, the smoker's age, sex and race were obtained, but other demographic data was frequently not recorded. In 57 of the cases, samples of the ignited furniture were obtained and sent to the CPSC for fabric and padding material identification.

The study showed that it is possible to identify the characteristics of cigarettes involved in fires.

Within this small, non-random sampling, there was a prevalence of non-filtered cigarettes and cigarettes with a high amount of tobacco, compared to the national averages. The appearance of a non-random distribution of packings further encourages the creation of a full-scale study.

Economic Impact and Other Consequences

Including Analysis of the Possible Costs and Benefits,[5] Both to the Industry and the Public, Associated with Any Such Product Modification

The Technical Study Group finds that adaptation (if commercially feasible) of the cigarette-modification concepts described earlier would reduce the number of fire deaths and injuries. The next step is to calculate how large the life and property savings would be. It is also necessary to estimate the (possibly interactive) effects on those parts of the economy and society that would be affected by changes in the cigarette design and construction. Then, the overall societal effects can be appraised. To do this, a model to predict economic impact was constructed by the Center for Applied Mathematics of the National Bureau of Standards.[22]

A projection of future fire losses was developed for the model by the Fire Analysis Division of the National Fire Protection Association (NFPA).[8] The projection used assumptions regarding both the recent trends in fire losses and potential future contributing factors. This projection was then changed by the introduction of several less fire-prone cigarettes of varying effectiveness. The performance of each improved cigarette was based on the NBS-CFR laboratory findings. The test performance of each cigarette on selected substrates is linked to a reduction in fire losses using a method developed by NFPA.[8] This method also defines the laboratory data needed for future predictions of the effectiveness of cigarette modifications. Potential savings are shown in Table 7, which presumes the manufacture of a cigarette which does not start fires. This also assumes that approximately 600 billion cigarettes will be consumed annually.

While the assumptions introduce large uncertainties in the projections, the *magnitudes* of the potential savings are likely correct for future cigarettes of very low ignition propensity.

Five different cigarette modifications were selected for the economic impact model based on consultation with experts early in the TSG project. (They therefore do not necessarily correspond to the tested experimental cigarettes.)

- Reduction in cigarette circumference,
- Decrease in the tobacco packing density,
- Additive to the tobacco to cause self-extinguishment,
- Increase in the weight of the paper, and
- Decrease in the porosity of the paper.

Because these cover the major physical descriptors of the cigarette and involve the major variables in the production of the cigarettes, the model can accommodate many other modifications that might be proposed at a later time.

The potential effects included in the economic impact model are as follows. Input data for each of these were provided by experts hired by the Technical Study Group based on a broad consultation.

Fire Losses [8]	changes in lives lost, injuries, and direct property damage
Tobacco Farming [23]	tobacco price, domestic sales, tobacco revenue
Cigarette Industry [24]	cigarette price, domestic sales, cigarette revenue
Health [25]	medical costs, life-years
Tax and Consumer [26]	Federal excise tax revenue, consumer surplus
Employment [27]	tobacco sector, cigarette sector, other sectors

Table 7. Potential 11-Year (1986-1996) Savings from Avoided Cigarette-Initiated Fires of Upholstered Furniture and Mattresses [8]

	Potential Savings
Fires	250,000
Civilian Injuries	34,000
Fire Fighter Injuries	16,000
Total Fire Deaths	15,000
Property Damage	2.6 billion

[5] *"Benefit" here refers specifically to the reductions in fire losses and any positive economic changes resulting from modifications in cigarettes. It does not imply any benefit from the use of cigarettes.*

193-852 0 - 87 - 2

Secondary impacts on other industries, such as paper, fertilizer, container, manufacturing equipment, chemical, transportation, and advertising, and on cigarette industry product liability are not included. Human effects (deaths, injuries) are discussed separately from financial impacts.

The possible change in health effects is a serious issue. There is a concern that the composition of the smoke in less ignition-prone cigarettes might be more toxic than smoke from current cigarettes. Prior to marketing a future low ignition propensity cigarette, an analysis of its smoke composition needs to be carried out to determine if that composition has the potential of increasing the toxicity over its present level. In addition, future product modifications might affect such health-related factors as the consumption rate of cigarettes or the age at which people start smoking.[28,29,30] The TSG is concerned about the smoke toxicity issue, but could not resolve it within the scope of this project.

The economic impact model has a place to include changes in smoke toxicity. Since the per puff tar, nicotine, and carbon monoxide yields from the better-performing experimental cigarettes were not appreciably different from the best-selling commercial cigarettes [19], the present use of the model assumed that the less ignition-prone cigarette of the future would not produce smoke of toxicity different from present cigarettes.

A large number of calculations have been made using the five cigarette modifications mentioned earlier with different effectiveness in eliminating ignitions.[22] The calculations are based on a complex set of data and require broad assumptions. In each case, care was taken to select the most appropriate. These cases produced a range of economic and human impacts.

The model, as constructed using these broad assumptions, predicts that any of the modifications considered would result in only small changes in the cost of cigarettes, unemployment, health care costs, life expectancy, and the financial status of the affected industries and professions.

Conclusions

The Technical Study Group finds that it is technically feasible and may be commercially feasible to develop cigarettes that will have a significantly reduced propensity to ignite upholstered furniture or mattresses. Furthermore, the overall impact on other aspects of the United States society and economy may be minimal. Thus it may be possible to solve this problem at costs that are less than the potential benefits, assuming the commercial feasibility of the modified cigarettes.

The particular conclusions of this study are as follows:

- There are cigarette characteristics whose variations in the laboratory reduced the ignition propensity of the cigarette. These are: reduced circumference, lower density tobacco, less porous paper, and reduction of citrate addition to the paper. Considerably larger reductions were achieved with combinations of these. Several patented approaches also offer directions for further investigation. Limited evidence suggests the presence of a filter may also have some effect on ignition propensity.

- The differences in ignition propensity among selected current commercial cigarettes are unimportant.

- Measurements of cigarette ignition propensity on upholstered furniture mockups are reasonable indicators of performance on full-scale furniture made of the same materials. However, the wide lot-to-lot variation in those materials limits the use of such mockups for cigarette testing over a long period of time and by different laboratories.

- A valid and reliable measurement method is needed to determine that a cigarette is less ignition-prone. It is also important to collect information on cigarette-initiated fires to determine how successfully future cigarettes perform.

- The manufacture of less fire-prone cigarettes may require some advances in cigarette design and manufacturing technology.

- No cigarettes were tested for their acceptability to the smoking public. However, some physical characteristics which decrease a cigarette's propensity to ignite soft furnishings are incorporated individually in some commercial cigarettes. Combinations of all characteristics of the lowest ignition propensity cigarettes have not been incorporated in any commercial cigarettes.

- The overall effects of the cigarette modifications considered may result in only small changes in the price of cigarettes, unemployment, health care costs, life expectancy, and the financial status of the affected industries and professions. This conclusion involves a number of broad but necessary assumptions.

- The per puff tar, nicotine, and carbon monoxide yields from some of the least ignition-prone experimental cigarettes were within the ranges of yields from the best-selling commercial cigarettes. These cigarettes have a significantly higher resistance to puffing and a marginally lower number of puffs than do current commercial cigarettes. The toxicity of smoke from a future low ignition propensity cigarette needs to be addressed, as would the smoke from any substantially modified commercial cigarette, before its introduction into the marketplace.

Recommendations for Further Technical Work

- A standard test method is needed to determine cigarette ignition propensity. Such a method should be developed as soon as possible and validated using the current set of experimental cigarettes.
- Performance data for current market cigarettes should be generated using the new test method. These data could then be compared to future year cigarette performance.
- A study to collect baseline and follow-up data about the characteristics of cigarettes, products ignited, and smokers involved in fires should be designed and implemented.
- Systematic knowledge should be developed (from existing or new sources, as appropriate) on (a) changes in the toxicity of smoke and resultant health effects from modified cigarettes, and (b) societal costs of injuries from cigarette-initiated fires.
- Both the laboratory studies on and computer modeling of ignition physics should be continued to develop a valid, user-friendly predictive capability. This would enable inexpensive screening for ignition propensity of future cigarette concepts. (The authors of reference 19 have offered more detailed recommendations for further research.)

Acknowledgements

The Technical Study Group is pleased that so complex a project with so short a lifetime has progressed so successfully. This is in large part due to the enthusiastic contributions of a large number of people.

Critical technical support was provided by a variety of organizations and key individuals:

National Bureau of Standards
Center for Fire Research
- Richard H. Harris, Jr.
- John F. Krasny
- Robert S. Levine
- Henri E. Mitler
- Thomas J. Ohlemiller

National Bureau of Standards
Center for Applied Mathematics
- Rosalie T. Ruegg
- Steven F. Weber
- Barbara C. Lippiatt
- Sieglinde K. Fuller

National Fire Protection Association
Fire Analysis Division
- John R. Hall, Jr.

Consumer Product Safety Commission
- Beatrice Harwood
- L. James Sharman
- Dale Ray
- Charles Smith
- Margaret Neily
- Linda Fansler

University of Maryland
- David Greenberg
- John E. Calfee

North Carolina State University
- Daniel A. Sumner

Ecosometrics, Inc.
- Armando M. Lago
- Jennifer A. Shannon

Bureau of Home Furnishings
State of California
- Gordon H. Damant
- John A. McCormack
- Bernadette Claire

Policy Analysis, Inc.
- Gerald O. Oster

American University
- Gary T. Ford

Chase, Brown, and Blaxall, Inc.
- John P. Brown

Sealy, Inc.
- Alvin Klancnik

Kimberly Clark, Inc.
- William Selke

Guilford Laboratories
- James Rayburn

Lorillard, Inc.
- Arthur M. Ihrig
- Vello Norman
- A. Leonard Rhyne

The Technical Study Group also wishes to thank those individuals who provided critical reviews of the several reports: Gordon H. Damant, James V. Ryan, Giuliana Tesoro, Robert D. Tollison, Eugene M. Lewit, Dietrich Hoffman, David Burns, Paul Gottfried, Philip S. Schaenman, Ron Darrah, Robert Crandall, David Lucht, Carleton Currens, and Frederic B. Clarke III.

This project relied heavily on the timely contributions of non-production cigarettes and upholstered furniture from those two industries. Those critical donations are most appreciated.

The Technical Study Group credits the members of the 98th and 99th Congresses for their perception of the importance of reducing cigarette-initiated fires and their persistence in providing the necessary funding to carry out this study. The Consumer Product Safety Commission and the Federal Emergency Management Agency also applied appropriated funds in support of this program.

Appreciation is due to the members of the Interagency Committee for their participation and support.

Appreciation is also expressed for the efforts of Marilyn Ugiansky, Brenda Thompson, and Kay Villa of NBS, Linda Sherman Design, Inc., and Word Design, Inc. for their preparation of the TSG reports for publication.

Last, but far from least, the TSG thanks Colin B. Church of the Consumer Product Safety Commission who, as Secretariat to the Group, tended to all the crucial administrative functions that often go unnoticed, but without which programs like this could not succeed.

References

[1] Karter, M.J., "Fire Loss in the United States During 1984," Fire Journal, 79 15, September, 1985.

[2] Washburn, A.E., Harlow, D.W., Fahy, R.F., "U.S. Fire Fighter Deaths," Fire Command, 52 21, June, 1985.

[3] Karter, Jr., M.J., Harlow, D.H., and Washburn, A.E., "U.S. Fire Fighter Injuries 1984," Fire Command, 52 24, November, 1985.

[4] Estimated from Hall, Jr., J.R., "The Total Cost of Fire in the U.S.A.," Fire Journal, 80 83, May, 1986.

[5] a. Schaenman, P. S., International Concepts in Fire Protection, Ideas From Europe That Could Improve U.S. Fire Safety, TriData, Arlington, Virginia, 1982.
b. Schaenman, P.S., and Seits, E.F., International Concepts in Fire Protection, Practices from Japan, Hong Kong, Australia, and New Zealand, TriData, Arlington, Virginia, 1985.

[6] Karter, M.J., "Fire Loss in the United States During 1985," Fire Journal, 80 26, September, 1986.

[7] Maxwell, Jr., J.C., "The Maxwell Report: Revised 1985 Year-End Sales Estimates for the Cigarette Industry," Furman Selz Mager Dietz & Birney, Inc., 1985.

[8] Hall, Jr. J.R., "Expected Changes in Fire Damages from Reducing Cigarette Ignition Propensity," Report No. 5, Technical Study Group, Cigarette Safety Act of 1984, 1987.

[9] "Eighth Annual Flammable Fabrics Report," U.S. Consumer Product Safety Commission, Washington, D.C., December, 1980.

[10] Harwood, B., "Trends in Cigarette-Ignited Fires," U.S. Consumer Product Safety Commission, Washington, D.C., March 1, 1985.

[11] "Standard for the Flammability of Mattresses and Mattress Pads," 16 Code of Federal Regulations, Part 1632, 1973.

[12] "Cigarette Ignition Resistance of Components of Upholstered Furniture," NFPA 260A-1983, National Fire Codes, National Fire Protection Association, Quincy, Mass., published annually.

[13] "Resistance of Mock-up Upholstered Furniture Material Assemblies to Ignition by Smoldering Cigarettes," NFPA 260B-1983, National Fire Codes, National Fire Protection Association, Quincy, Mass., published annually.

[14] Ray, D., Consumer Product Safety Commission. private communication.

[15] Spears, A., Lorillard, Inc., private communication.

[16] Maxwell, Jr., J.C., "Cigar Sales Still Slumping," Advertising Age, p. 26, August 4, 1986.

[17] Krasny, J.F., "Cigarette Ignition of Soft Furnishings--A Literature Review With Commentary," Report No. 2, Technical Study Group, Cigarette Safety Act of 1984, and NBSIR 87-3509, U.S. National Bureau of Standards, Gaithersburg, MD, 1987.

[18] Krasny, J.F. and Gann, R.G., "Relative Propensity of Selected Commercial Cigarettes to Ignite Soft Furnishings Mockups," Report No. 1, Technical Study Group, Cigarette Safety Act of 1984, and NBSIR 86-3421, U.S. National Bureau of Standards, Gaithersburg, MD, 1986.

[19] Gann, R.G., Harris, Jr., R.H., Krasny, J.F., Levine, R.S., Mitler, H.E., and Ohlemiller, T.J., "The Effect of Cigarette Characteristics on the Ignition of Soft Furnishings," Report No. 3, Technical Study Group, Cigarette Safety Act of 1984, 1987.

[20] Damant, G.H., McCormack, J.A., and Claire, B., "Tests of Smoldering Ignition of Chairs and Reduced-Scale Mockups by Various Cigarettes," Report No. 7, Technical Study Group, Cigarette Safety Act of 1984, 1987.

[21] Harwood, B. and Fansler, L., "Feasibility Study of Obtaining Field Data on Cigarette-Initiated Fires," Report No. 8, Technical Study Group, Cigarette Safety Act of 1984, 1987.

[22] Ruegg, R.T., Weber, S.F., Lippiatt, B.C., and Fuller, S.K., "Improving the Fire Safety of Cigarettes: An Economic Impact Analysis," Report No. 4, Technical Study Group, Cigarette Safety Act of 1984, 1987.

[23] Sumner, D.A., "A Study of the Impact of Cigarette Modifications on the Tobacco Production Industry in the United States," in Report No. 6, Technical Study Group, Cigarette Safety Act of 1984, 1987.

[24] Lago, A.L., and Shannon, J.A., "Cost Analysis of Options for Self-Extinguishing Cigarettes," in Report No. 6, Technical Study Group, Cigarette Safety Act of 1984, 1987.

[25] Oster, G.O., "Estimates of the Economic and Non-Economic Health Consequences of Smoking, Smoking Cessation, and Reduction in the Amount Smoked," in Report No. 6, Technical Study Group, Cigarette Safety Act of 1984, 1987.

[26] Ford, G.T., Brown, J.P., and Calfee, J.E., "The Costs and Benefits to Smokers of Reduced Flammability Cigarettes," in Report No. 6, Technical Study Group, Cigarette Act of 1984, 1987.
[27] Greenberg, D., "The Employment Implications of Proposed Cigarette Design Modifications to Reduce Cigarette Ignition Propensity," in Report No. 6, Technical Study Group, Cigarette Safety Act of 1984, 1987.
[28] The Surgeon General's Report, Office of the Surgeon General, U.S. Department of Health and Human Services, Washington, D.C., 1986.
[29] Evaluation of the Carcinogenic Risk of Chemicals to Humans: Tobacco Smoking, International Agency for Research on Cancer, World Health Organization, Lyon, France, pp. 203-244, 1986.
[30] Environmental Tobacco Smoke: Measuring Exposures and Assessing Health Effects, National Research Council, National Academy Press, Washington. D.C., 1986.

Appendix A
Cigarette Safety Act of 1984

Public Law 98-567
98th Congress

An Act

To establish an interagency committee and a technical study group on cigarette safety.

Oct. 30, 1984
[H.R. 1880]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Cigarette Safety Act of 1984".

Cigarette Safety Act of 1984.
15 USC 2054 note.

SEC. 2. (a) There is established the Interagency Committee on Cigarette and Little Cigar Fire Safety (hereinafter in this Act referred to as the "Interagency Committee") which shall consist of—

Establishment.
15 USC 2054 note.

(1) the Chairman of the Consumer Product Safety Commission, who shall be the Chairman of the Interagency Committee;

(2) the United States Fire Administrator in the Federal Emergency Management Agency, who shall be the Vice Chairman of the Interagency Committee; and

(3) the Assistant Secretary of Health in the Department of Health and Human Services.

(b) The Interagency Committee shall direct, oversee, and review the work of the Technical Study Group on Cigarette and Little Cigar Fire Safety (established under section 3) conducted under section 4 and shall make such policy recommendations to the Congress as it deems appropriate. The Interagency Committee may retain and contract with such consultants as it deems necessary to assist the Study Group in carrying out its functions under section 4. The Interagency Committee may request the head of any Federal department or agency to detail any of the personnel of the department or agency to assist the Interagency Committee or the Study Group in carrying out its responsibilities. The authority of the Interagency Committee to enter into contracts shall be effective for any fiscal year only to such extent or in such amounts as are provided in advance by appropriation Acts.

Contracts with U.S.

(c) For the purpose of carrying out section 4, the Interagency Committee or the Study Group, with the advice and consent of the Interagency Committee, may hold such hearings, sit and act at such times and places, take such testimony, and receive such evidence, as the Interagency Committee or the Study Group considers appropriate.

SEC. 3. (a) There is established the Technical Study Group on Cigarette and Little Cigar Fire Safety (hereinafter in this Act referred to as the "Study Group") which shall consist of—

Establishment.
15 USC 2054 note.

(1) one scientific or technical representative each from the Consumer Product Safety Commission, the Center for Fire Research of the National Bureau of Standards, the National Cancer Institute, the Federal Trade Commission, and the Fed-

51-139 O - 84 (621)

eral Emergency Management Agency, the appointment of whom shall be made by the heads of those agencies;

(2) four scientific or technical representatives appointed by the Chairman of the Interagency Committee, by and with the

advice and consent of the Interagency Committee, from a list of individuals submitted by the Tobacco Institute;

(3) two scientific or technical representatives appointed by the Chairman of the Interagency Committee, by and with the advice and consent of the Interagency Committee, who are selected from lists of individuals submitted by the following organizations: the American Burn Association, the American Public Health Association, and the American Medical Association;

(4) two scientific or technical representatives appointed by the Chairman of the Interagency Committee, by and with the advice and consent of the Interagency Committee, who are selected from lists of individuals submitted by the following organizations: the National Fire Protection Association, the International Association of Fire Chiefs, the International Association of Fire Fighters, the International Society of Fire Service Instructors, and the National Volunteer Fire Council; and

(5) one scientific or technical representative appointed by the Chairman of the Interagency Committee, by and with the advice and consent of the Interagency Committee, from lists of individuals submitted by the Business and Institutional Furniture Manufacturers Association and one scientific or technical representative appointed by the Chairman, by and with the advice and consent of the Interagency Committee, from lists of individuals submitted by the American Furniture Manufacturers Association.

(b) The persons appointed to serve on the Study Group may designate, with the advice and consent of the Interagency Committee, from among their number such persons to serve as team leaders, coordinators, or chairpersons as they deem necessary or appropriate to carry out the Study Group's functions under section 4.

Study.
15 USC 2054 note.

SEC. 4. The Study Group shall undertake, subject to oversight and review by the Interagency Committee, such studies and other activities as it considers necessary and appropriate to determine the technical and commercial feasibility, economic impact, and other consequences of developing cigarettes and little cigars that will have a minimum propensity to ignite upholstered furniture or mattresses. Such activities include identification of the different physical characteristics of cigarettes and little cigars which have an impact on the ignition of upholstered furniture and mattresses, an analysis of the feasibility of altering any pertinent characteristics to reduce ignition propensity, and an analysis of the possible costs and benefits, both to the industry and the public, associated with any such product modification.

Reports.
15 USC 2054 note.

SEC. 5. The Interagency Committee shall submit one year after the date of enactment of this Act a status report to the Senate and the House of Representatives describing the activities undertaken under section 4 during the preceding year. The Interagency Committee shall submit a final technical report, prepared by the Study Group, to the Senate and the House of Representatives not later than thirty months after the date of enactment of this Act. The Interagency Committee shall provide to the Congress, within sixty days after the submission of the final technical report, any policy recommendations the Interagency Committee deems appropriate. The Interagency Committee and the Study Group shall terminate one month

Termination.

after submission of the policy recommendations prescribed by this section.

Confidentiality. 15 USC 2054 note.

SEC. 6. (a) Any information provided to the Interagency Committee or to the Study Group under section 4 which is designated as trade secret or confidential information shall be treated as trade secret or confidential information subject to section 552(b)(4) of title 5, United States Code, and section 1905 of title 18, United States Code, and shall not be revealed, except as provided under subsection (b). No member of the Study Group or Interagency Committee, and no person assigned to or consulting with the Study Group, shall disclose any such information to any person who is not a member of, assigned to, or consulting with, the Study Group or Interagency Committee unless the person submitting such information specifically and in writing authorizes such disclosure.

(b) Subsection (a) does not authorize the withholding of any information from any duly authorized subcommittee or committee of the Congress, except that if a subcommittee or committee of the Congress requests the Interagency Committee to provide such information, the Chairman of the Interagency Committee shall notify the person who provided the information of such a request in writing.

(c) The Interagency Committee shall, on the vote of a majority of its members, adopt reasonable procedures to protect the confidentiality of trade secret and confidential information, as defined in this section.

15 USC 2054 note.

SEC. 7. As used in this Act, the terms "cigarettes" and "little cigars" have the meanings given such terms by section 3 of the Federal Cigarette Labeling and Advertising Act.

Approved October 30, 1984.

LEGISLATIVE HISTORY—H.R. 1880 (S. 1935):

HOUSE REPORT No. 98-917 (Comm. on Energy and Commerce).
SENATE REPORT No. 98-597 accompanying S. 1935 (Comm. on Governmental Affairs).
CONGRESSIONAL RECORD, Vol. 130 (1984):
Aug. 6, considered and passed House.
Sept. 21, considered and passed Senate, amended, in lieu of S. 1935.
Oct. 1, House concurred in Senate amendment with an amendment.
Oct. 4, Senate concurred in House amendment.

Appendix B
Technical Study Group Membership

Member and Affiliation	Sponsor
Richard G. Gann, Ph.D., Chairman Center for Fire Research National Bureau of Standards	Center for Fire Research/ National Bureau of Standards
Edward Press, M.D., Vice-Chairman Public Health Consultant	American Medical Association & American Public Health Association
Charles M. Carey Upholstered Furniture Action Council	American Furniture Association
James L. Charles, Ph.D. Philip Morris U.S.A.	Tobacco Institute
Joseph W. Cullen, Ph.D. National Cancer Institute	National Cancer Institute
John C. Gerard National Fire Protection Association	National Fire Protection Association
James F. Hoebel Consumer Product Safety Commission	Consumer Product Safety Commission
Preston H. Leake, Ph.D. American Tobacco Company	Tobacco Institute
Michael D. McGibeny Daytona Beach Fire Department	International Association of Fire Chiefs
Andrew McGuire Trauma Foundation	American Burn Association & Trauma Foundation American Public Health Association
Wendy H. Poel Herman Miller, Inc.	Business and Institutional Furniture Manufacturers Association
Alexander W. Spears, III, Ph.D. Lorillard, Inc.	Tobacco Institute
Henry Tovey Federal Emergency Management Agency	Federal Emergency Management Agency
David E. Townsend, Ph.D. R.J. Reynolds Tobacco Company	Tobacco Institute
Judith P. Wilkenfeld, Esq. Federal Trade Commission	Federal Trade Commission

Past Members

Howard Beales, III
Federal Trade Commission

Harry I. Cohen
Consumer Product Safety Commission

Craig G. Drummond
Los Angeles County Fire Department

Max Hausermann, Ph.D.
Philip Morris U.S.A.

Alan Rodgman, Ph.D.
R.J. Reynolds Tobacco Company

Sponsor

Federal Trade Commission

Consumer Product Safety Commission

National Fire Protection Association

Tobacco Institute

Tobacco Institute

Appendix C
Chronology of Technical Study Group Meetings

1. January 3, 1985

   Principal Topics: Introductions of participants; delineate legal requirements; select operating procedures; establish objectives; formulate plan to collect background literature; review of UFAC work on furniture ignitions and CPSC work on mattress ignitions; election of Chairman and Vice-Chairman.

   Important Decisions: Follow *Robert's Rules of Order* where practical; all issues to be decided by majority vote, except that the mandated status and final reports would require a two-thirds majority; elected Richard G. Gann Chairman and Edward Press Vice-Chairman.

2. January 28-29, 1985

   Principal Topics: Rules for TSG alternates, guest speakers, and confidential meetings and materials; presentations on physical characteristics which affect ignition (Spears), assessing health effects (Cullen, Hoffman), elements of economic impact analysis; proposal from NBS on ignition propensity measurement using experimental cigarettes (Gann); subgroup activity to develop a project plan.

   Important Decisions: Accepted offer from CPSC of Colin Church to be TSG Secretariat; little cigars not to be studied due to very small market share and ordinary fire hazard; working plan to be balloted and sent to the IAC.

3. March 4-5, 1985

   Principal Topics: Report that the TSG had submitted the "Working Plan on Resource Needs Assessment" to the IAC on February 12 and that the IAC and OMB had reviewed it; presentations on mattress flammability (Klancnik), variables affecting ignition (Norman), candidate ignition test method (Krasny), test procedure for self-extinguishment of cigarettes (Selke), cigarette ignition testing (Rayburn); discussion of proposal to test current commercial cigarettes; report on state activities; tour of Philip Morris cigarette manufacturing plant.

   Important Decisions: Voted to test commercial cigarettes; subgroup commissioned to propose plan (Cohen, Damant, Klancnik, Krasny, Spears, Sharman, Ziolkowski).

4. April 15, 1985

   Principal Topics: No funding yet; presentation of furniture ignition testing in California (Damant); discussion of subgroup report on testing commercial cigarettes; presentation and discussion of NBS ignition propensity measurement project (Gann).

   Important Decisions: Referral of media contacts to TSG Chairman or Secretariat; approval of commercial cigarette testing project; future meetings not to be held without travel reimbursement.

5. July 11-12, 1985

   Principal Topics: First Public Meeting—presentations by inventors of "fire-safe" cigarettes (Cohn, LaHue, Waco, Canavor) and others (Martin, Stamm, Grannis); noted that funding for commercial cigarette testing had been transferred from CPSC to NBS; further discussion of NBS ignition propensity measurement project; establish three subgroups for further project delineation.

   Important Decisions: Approval of revised plan for commercial cigarette testing, cigarettes and materials available for possible parallel studies; Gann to draft status report to Congress for TSG approval.

6. September 5, 1985

   Principal Topics: Noted that $0.5M had been added to the CPSC FY 1985 budget for Cigarette Safety Act activities ($475k to NBS to begin ignition propensity measurement project; $25k for TSG travel); progress report on commercial cigarette testing; discussion of data subgroup report (Cohen); discussion of economic impact analysis needs and possible contractors.

   Important Decisions: Congressional status report text approved for forwarding to the IAC.

7. October 21-22, 1985

Principal Topics: Noted that the Federal Emergency Management Agency had provided $150k for the NBS ignition propensity measurement project; proposal for economic impact analysis (Ruegg); tour of NBS fire research facilities; discussion of TSG data needs to support benefit/cost analysis; presentation of preliminary results of commercial cigarette testing; progress report on ignition propensity measurement of experimental cigarettes.

Important Decisions: Approved NBS to perform the economic impact analysis.

8. January 9, 1986

Principal Topics: Noted that $1M added to FY 1986 CPSC budget for Cigarette Safety Act work and that IAC supported 6-month extension and request to Congress for remaining $600k; noted that funds had been transferred from CPSC to NBS for completion of the ignition propensity measurement project and the economic impact analysis; discussion on testing patented cigarettes and the selection criteria.

Important Decisions: Voted to include the testing of patented cigarettes in the NBS ignition propensity measurement project.

9. May 8, 1986

Principal Topics: Discussion of draft report on commercial cigarette testing; progress reports on NBS ignition propensity measurement project (Gann) and economic impact analysis (Ruegg); discussion of solicitation for submission of patented cigarettes for testing; brief presentations by data contractors for economic impact analysis: fire loss data (Hall), health care (Ruegg for Oster), labor (Greenberg), consumer acceptance (Brown and Ford), and production costs (Lago).

Important Decisions: Voted to hold a second public meeting; voted to prepare a second status report to the Congress.

10. July 10-11, 1986

Principal Topics: Sumner (tobacco farming) added as data source for economic impact analysis; CPSC report on identifying cigarettes involved in fires (Cohen); status reports on ongoing contracts; Second Public Meeting – presentations by LaHue, Myers, Briese, Scholl.

Important Decisions: Text of second status report to the Congress approved for forwarding to the IAC; approved text of NBS report on commercial cigarette testing.

11. September 9, 1986

Principal Topics: Noted that the IAC had approved the TSG Chairman forwarding press releases to the IAC Chairman for issuance following meetings: commercial cigarette testing report issued by NBS; progress report on ignition propensity measurement project – second set of experimental cigarettes requested; discussed draft plan for TSG operations for the remainder of the program.

Important Decisions: Approved operating plan for the remainder of the program (approved by IAC 10/7/86).

12. January 6, 1987

Principal Topics: Noted that Congress had approved both the 6-month extension to the Act and the remaining $600k; discussion of progress on ignition propensity measurement project; cigarette ignition literature survey distributed for comment; discussion of American Tobacco Company testing of three patented cigarettes; review of status of all TSG contracts.

Important Decisions: Approved schedule for remainder of program.

13. February 12-13, 1987

Principal Topics: Noted that pilot field data study is underway in conjunction with the International Association of Fire Chiefs and nine cities; presentations and review of six completed studies in support of economic impact analysis; tour of NBS cigarette study laboratories.

Important Decision: Selection of values of variables for case studies of the economic impact analysis.

14. June 29-30, 1987

Principal Topics: Discussion with authors of reviewed technical reports by TSG members and peer reviewers; distribution of first draft of TSG final report.

Important Decisions: First draft of TSG final report to be held confidential.

15. July 16-17, 1987

Principal Topic: Discussion of first draft of TSG final report.

Important Decisions: Second draft of TSG final report to be held confidential.

16. August 17, 1987

Principal Topic: Discussion of second draft of TSG final report.

Important Decisions: Approval of text of all technical reports; consensus on content of TSG final report.

17. September 10, 1987

Principal Topic: Presentation of (third) draft TSG findings to public for comment. Comments by LaHue, Schaenman, Meisel. Discussion of third draft of TSG final report.

Important Decision: Continued consensus on content of TSG final report.

18. September 21, 1987

Principal Topic: Discussion of fourth draft of final report.

Important Decision: Unanimous approval of TSG final report.

Appendix D
Working Paper on Resource Needs Assessment (February 15, 1985)

Executive Summary

The Cigarette Safety Act of 1984 instructed a broad based group of 15 experts "to determine the technical and commercial feasibility, economic impact and other consequences of developing cigarettes and little cigars that will have a minimum propensity to ignite upholstered furniture or mattresses." This Technical Study Group has prepared the attached plan outlining specific projects and their costs which are necessary to fulfill the requirements of the Act.

The projects include identification of the different physical characteristics of cigarettes and little cigars which have an impact on the ignition of upholstered furniture and mattresses, and analysis of the feasibility of altering any pertinent characteristics to reduce ignition propensity, and a cost-benefit analysis (including both industry and public factors) associated with any such product modification. The estimated total cost is $2.7 million over 30 months.

As mandated by the Act, an Interagency Committee comprised of the Chairman of the Consumer Product Safety Commission, the United States Fire Administrator in the Federal Emergency Management Agency, and the Assistant Secretary of Health in the Department of Health and Human Services has reviewed and approved this plan subject to obtaining the necessary funding.

Introduction

On October 4, 1984, the 98th Congress passed the Cigarette Safety Act of 1984. Within this law is the establishment of an Interagency Committee on Cigarette and Little Cigar Fire Safety (IAC) and a Technical Study Group on Cigarette and Little Cigar Fire Safety (TSG). The charge to the TSG is to "undertake, subject to oversight and review by the Interagency Committee, such studies and other activities as it considers necessary and appropriate to determine the technical and commercial feasibility, economic impact, and other consequences of developing cigarettes and little cigars that will have a minimum propensity to ignite upholstered furniture or mattresses. Such activities include identification of the different physical characteristics of cigarettes and little cigars which have an impact on the ignition of upholstered furniture and mattresses, an analysis of the feasibility of altering any pertinent characteristics to reduce ignition propensity, and an analysis of the possible costs and benefits, both to the industry and the public, associated with any such product modification." The IAC is directed to submit a status report to the Congress in October 1985 and a final technical report, prepared by the TSG, in April 1987.

Following its expeditious formulation by the Interagency Committee, the TSG first met on January 3, 1985. During that meeting the Study Group began delineating the scope of its studies. That process was continued at a meeting January 28-29, 1985. This document represents the consensus of the Study Group and our assessment of the resources needed to carry out that stated objectives in response to the Act.

Our activities over the next 25 months will provide a rational, documented basis for solutions to the national problem of the ignition of soft furnishings by smoking materials. These activities have the goals of defining the current knowledge of the phenomenon, describing an approach to quantitatively measuring the phenomenon, and assessing the impact of proposed solutions, leading to a judgment of the feasibility of cigarettes with improved ignitability performance. Independent verification of the output of these activities is not possible within the given time frame.

While the Act specifically directs studies related to cigarettes and little cigars, the TSG feels that the latter may well be of little concern. Preliminary information, to be confirmed, indicates that little cigars represents *ca.* 0.2 percent of cigarette sales. Unless evidence is obtained that this small fraction represents a highly disproportionate contribution to fire losses, the TSG deems it appropriate to concentrate its limited resources on the cigarette.

No such simplification of the Act appears possible with regard to furniture vs. mattresses. Current data indicate that deaths from bedding fires and approximately one half those from upholstered furniture fires, and thus neither component can be neglected.

With these boundaries in mind, the following sections describe the anticipated areas of activity and the quantity and nature of resources currently deemed necessary to meet our objectives. We realize that en route to these, new ideas will emerge and that further or redirected resources may be necessary.

I. IGNITABILITY MEASUREMENT

A. Objective

The purposes of this study are: (1) to report the state-of-the-art in understanding cigarette ignition of soft furnishings; (2) to elucidate the thermal conditions existent about lit smoking materials, their energy transfer to various substrates, and the ensuing substrate ignition process; and (3) to identify the characteristics of cigarettes that affect ignition propensity. The resulting apparatus and model will then be capable of realistically demonstrating differing propensities of the smoking materials to ignite upholstered furniture and bedding.

Ignition is defined as the sustained smoldering or flaming of upholstered furniture or mattress substrate. This may or may not lead to flaming. *Substrate* is defined as the combination of covering fabric, padding, bedding, etc. in one or more selected geometries.

B. Approach

Previous studies on the ignitability of soft furnishings by smoking materials will be compiled. This will cover all published information and as many industry-confidential papers as are made available. The diverse approaches to measurement will be analyzed. Tables will be composed of the various test methodologies used, parameters that have been varied and the impact of these changes on ignitability, on other factors that relate to ignition, and on health effects (e.g., smoke yield and composition). If its contents warrant, this report will be labeled "confidential"; and its distribution will be limited to the Technical Study Group, the Interagency Committee, and the appropriate members and staff of the Congress.

Existing literature on the energetics of cigarette burning will be supplemented by laboratory measurements on experimental and current commercial cigarettes. Combined, these will form the input for a computer model of the thermal properties of lit cigarettes. A range of possible stages of smoking will be represented (e.g., newly lit, mid-length, near-butt). The physical and combustion properties of the cigarette will be included as variables. This list would likely include: diameter, length, tobacco density, linear burning rate, length of burn zone, temperature distribution in burn zone, relative burn rate of paper, paper porosity, etc.

The heat transfer from the cigarette to a variety of substrates will then be studied, since the net energy balance on the heated portion of the substrate determines whether it will sustain smoldering. The three-dimensional, time-dependent temperature distribution that the cigarette heat flux and substrate reactions produce will be examined experimentally and modeled.

Building on prior studies, an extensive series of experiments will be performed to guide and verify the ignition model. These will employ cigarettes that have been systematically varied with regard to the properties listed above. The ranges of those variables will be determined by the available data, the model predictions, and the existing manufacturing capability. The substrates will be selected to represent realistic best, and worst hazards, both with regard to materials and geometry. During these experiments, measurements will include such macro-observables as time to ignitions and mass loss rate, as well as some of the more elementary parameters described earlier.

Based on the fire and market data described in Section III and a sensitivity analysis, the complex experimental program will then be simplified to a streamline protocol. This limited sequence of materials, geometries, and measurements may serve as a screening tool for assessing the effectiveness of cigarette modification or other new technology in reducing the propensity for ignition.

During the course of this study, and after acceptable measurement methods have been developed, the appropriate procedures will be applied to a blind sample of current market cigarettes. This will constitute a baseline performance level of ignitability for use in the cost/benefit models.

C. Resources

It is estimated that this project can be completed in 21 months elapsed time, including preparation of the final report. This time interval would start upon receipt of the funds. The literature review is estimated to be completed in 12 months. The timely completion of the experimental portion of the study would be contingent upon the availability of the specially-designed cigarettes and on the absence of unexpected developments. The TSG identifies the National Bureau of Standards' Center for Fire Research as uniquely qualified to carry out this study.

In order to complete the study in so short a time, the needed resources are:

Literature Compilation and Review:		$ 200 k
Experimental and Theoretical Study:		
Senior staff	4.0 S.Y.	$ 460 k
Technicians	4.0 S.Y.	160 k
Programmer	1.0 S.Y.	65 k
Secretary	0.2 S.Y.	8 k
Equipment		105 k
Travel, etc.		2 k
		$ 800 k
Total Cost:		$1000 k

II. EXPERIMENTAL CIGARETTES

A. Approach

Samples for the program with maximum uniformity can best be obtained from the major cigarette manufacturers. The sample size will be on the order of 10,000, as a minimal run. An independent quality assurance laboratory will be used to verify sample specifications and uniformity.

The independent variables that could be evaluated in this program are as follows:

Cigarette paper additives	None, Citrates, Ammonium phosphate
Cigarette paper porosity	Low, medium, high
Tobacco filler composition	Bright, Burley, Oriental types
Tobacco density	Low, medium, high
Tobacco particle size	28 and 60 cuts per inch
Cigarette geometry	Round, oval
Cigarette circumference	19 and 25 mm
Cigarette length	Short, long
Cigarette filter	With and without

This list comprises nearly 1,000 possible cigarette variations, a number that is large relative to the capability of measurement.

B. Resources

The TSG estimates that 100 variations should be sufficient to explore most of the major effects. The tobacco industry will supply the samples. The cost of quality assurance testing is $4 k per sample, for a total cost of $400 k. A first series of samples could be prepared within six weeks after specification.

III. Data Analysis and Projections

A. Objective

The purpose is to acquire, compile, and analyze data for (1) estimates of potential reductions in fire incidents, and (2) other specific purposes identified by the Technical Study Group.

B. Approach

Current and historic market data and fire data related to cigarettes, upholstered furniture and mattresses will be obtained. These will be analyzed and trends projected into the future to estimate potential reductions in fire losses as a function of the various physical properties and burning characteristics of cigarettes. All data will be evaluated as to its degree of reliability.

Much of this effort will support the cost/benefit analyses described below. Thus, specific needs are expected to arise regularly as that project evolves.

Some already anticipated tests are:

1. Develop comparability, if possible, among various data sets.

2. Obtain fire data, including:

   a. current national estimates of fires, deaths, injuries, property loss associated with the Act's mandate (primarily NFIRS sources)

   b. trends associated with item a. above.

   c. materials first ignited in these fires (primarily NFIRS sources)

   d. age and other demographic characteristics of victims (primarily NFIRS sources)

   e. risk of ignition with various kinds of upholstered furniture (primarily CPSC data)

   f. risk of ignition with various kinds of mattresses (primarily CPSC data)

3. Obtain market data including:

   a. profile of current cigarette sales and characteristics of interest and trends (industry and government sources)

   b. profile of upholstered furniture currently in American households, currently being marketed and future trends (industry sources such as UFAC)

   c. profile of mattresses currently in American households, currently being marketed, and trends (industry sources such as NABM)

In addition, the TSG envisions the possibility of needing some form(s) of data not yet available. This will be commissioned as necessary.

C. Resources

Data analysis and projections will be generated throughout the TSG's existence. In addition to TSG members' contributions, contract support will be needed for an 18 month period:

Senior investigator	1.5 S.Y.	$ 180 k
Junior investigator	1.5 S.Y.	90 k
Secretarial support	0.5 S.Y.	20 k
Materials, travel, etc.		10 k
		$ 300 k
New data project		100 k
Total		$ 400 k

IV. Cost/Benefit Analysis

A. Objective

This task is to develop a framework for evaluating the impact of possible changes in cigarette ignition potential, and to apply that methodology to a variety of reasonable possibilities.

B. Approach

A general contractor will analyze the existing literature to develop a detailed framework for a cost/benefit analysis. Where possible, the contractor will use the capabilities obtained in the Data Analysis and Projection task to estimate the individual components.

The existing literature will be reviewed to assess the relationship between health effects and the tar, nicotine, carbon monoxide, and where appropriate, other components in smoke. In the event such a report does not already exist, contributory papers will be compiled.

It is anticipated that the task on Ignitability Measurement and other technological advances will identify certain improved-performance cigarettes. The smokes from certain of these will be tested to determine their carbon monoxide, tar, and nicotine contents, and may be subjected to more detailed chemical analyses and/or a possible limited biological screening, for evaluation of the effects of suspected changes in smoke composition and/or health risk.

For a sampling of cigarettes showing reduced ignition propensity, the TSG will evaluate the commercial manufacturing feasibility with particular input from its tobacco industry members. To be considered are the following elements of cigarette construction:

1. cigarette paper properties and its manufacture,
2. tobacco composition and its availability,
3. tobacco particle size and its processability,
4. cigarette dimensions with tax weight limitations and friability considerations, and
5. filters with their construction, material, processability, and dimension limitation.

A format will need to be devised for assessment of consumer acceptability of new products.

The contractor will combine the information with the output of the other tasks to apply the cost/benefit methodology to a variety of reasonable possibilities. Some hypothetical cases may be included for comparison.

C. Resources

Cost/benefit framework and operation	$ 350 k
Cigarette testing	200 k
	$ 550 k

V. Managerial and Administrative Support

To assist the Interagency Committee and the Technical Study Group, CPSC will provide program management and administrative support services. This includes program planning and monitoring, logistical support of meetings, and liaison with interested state and local governments. In addition, some services will be contracted, e.g., obtaining transcripts of hearings, report preparation and printing. These will require an additional $200 k.

VI. Travel Cost Reimbursement

Non-Federal members (10) of the Technical Study Group are reimbursed for their travel and communication costs, as are any invited speakers. The cost per meeting for members is estimated at $8,000. We estimate there will be sixteen more meetings. An additional $20,000 is estimated for solicited speakers. The total, which needs to be specifically designated as travel funds, is $150 k.

Resource Summary

Ignitability Measurement	$1000 k
Experimental Cigarettes	400 k
Data Analysis and Projections	400 k
Cost/Benefit Analysis	550 k
Management and Secretariat Support	200 k
Travel Cost Reimbursement	150 k
TOTAL	$2700 k

Appendix E
Update to Working Plan for Technical Study Group Program (September 12, 1986)

I. Total Available Funds — $353k

A. $68k Quality Assurance of Experimental Cigarettes

After considerable solicitation, CFR has determined that the quality assurance measurements and analysis of the experimental cigarettes will be significantly less costly than anticipated. This sum covers the in-house effort and subcontracting to obtain the data and the statistical treatment of the results.

B. $10k California BHF Test Data

The California Bureau of Home Furnishings is generating mock-up and full-scale data on furniture ignition by the standard test cigarette. A small grant would enable them to prepare an interim report (>400 items) comparing the two sets of results, thus helping us determine the degree to which the small scale results can be used to predict real-life ignitability.

C. $15k Cigarette Performance Data

Current research at NBS has identified some traits of the experimental cigarettes that correlate with reduced ignition propensity. This project would involve the confirmation of those results at an independent lab, such as the California Bureau of Home Furnishings.

D. $65k Alkali Metal Ion Effects

It has long been known that compounds containing alkali metal ions promote the smoldering of fabrics and padding. The concentration of such compounds is not controlled in the manufacturing process and may account for the poor reproducibility of laboratory results. Furthermore, such compounds could be deposited on furniture fabrics during use, especially from people sweating. To predict the reduction in cigarette ignitions using laboratory test results, the effect of the alkali ion concentrations in the test materials must be quantified.

E. $50k Field Data on Cigarette Ignitions

It is important that we set in place a process for obtaining data from actual cigarette ignitions of soft furnishings. The International Association of Fire Chiefs has volunteered leadership. In addition, to be durable, the process must be integrated with an existing national system, such as the National Fire Incident Reporting System. Thus, this pilot effort would also involve representatives of the U.S. Fire Administration, the National Fire Protection Association, the Consumer Product Safety Commission, and the National Bureau of Standards. An initial meeting is being scheduled for October.

F. $25k Cost Data on Cigarette Injuries

The Department of Health and Human Services has performed a massive survey of burn injury data. This data needs to be reviewed and summarized for use in the benefit/cost model. Analyses are to be performed considering the fraction of fire-caused injuries included in the HHS bank and the fraction of fire injuries that are burns.

NOTE: Hall contacted Massachusetts principal investigator. The data is both complex and inaccessible. TSG agreed not to pursue.

G. $40k Improved Fire Loss Analysis

John Hall of NFPA has provided an excellent analysis of expected fire losses for the next decade, applying far more effort than required by the contract. This effort should be augmented to (a) better address the superposition of the fire performance of less ignition-prone cigarettes on the overall fire loss profile and (b) revisit his identified limiting factors in his current fire loss projection methodology.

H. $50k Writing Final Report

A review of the material to be considered for the final report to the Congress indicates that outside writers would have difficulty delivering a top quality product in the permitted time frame. This funding is for the Chairman of the Technical Study Group to prepare the draft report and subsequent revisions. This becomes especially important if the Technical Study Group cannot meet or meets infrequently due to travel fund limitations.

I. $30k Publication Costs

This covers the design, preparation and printing of the final report and associated appendices.

II. Additional $600k

A. $290k Extensive Field Ignition Data Base

These funds would establish a long-term component of gathered and compiled fire data on cigarette ignitions and provide for the monitoring of trends as modified cigarettes assume a larger market share. The results would not be available for our final report. Monitoring of the project would be continued by the Consumer Product Safety Commission, the National Bureau of Standards and/or the U.S. Fire Administration.

NOTE. This project was disapproved by the IAC.

B. $50k Travel

This would enable the Technical Study Group to meet in FY 1987 as we assess the program's results and prepare a final report. It also includes a small amount of funds for interactions with laboratories and experts not located in the Washington, D.C. area.

C. $30k Updated Furniture Materials Survey

The survey information on furniture types in households generated by UFAC and CPSC needs to be updated and refined to increase the accuracy of fire incidence predictions with improved cigarettes. If appropriate, a statistically representative furniture "census" could be defined.

Note: This was not pursued.

D. $100k Full-Scale Furniture Testing

The cigarette ignition data from the bench-scale testing currently underway and the (new) test method to be recommended need to be validated against real furniture items. Selected furniture items indicative of the construction types that occur most in households or that are particularly at risk would be obtained. Their relative susceptibility to ignition by various experimental cigarettes would provide a more accurate assessment of the impact of the changes in cigarette manufacture and more realistic input for the benefit/cost model. The data will also provide a figure of merit for the cigarette ignition test method to be proposed. This cost presumes significant furniture industry assistance in obtaining the test items.

E. $50k Ignition Probability Analysis

At present, there is no methodology for calculating the impact on fire losses of an incremental improvement in lab test results for cigarette ignition propensity. This would establish such a formalism, including guidance for which bench-scale and full-scale ignition test data are needed for the desired accuracy in the prediction of fire losses.

F. $80k Upgrade of Benefit/Cost Analysis

The methodology and input data would be improved to treat more thoroughly the impact of those cigarettes (including tested patented cigarettes) found in the Technical Study Group program to have the lowest ignition propensity.

Appendix F
Text of *Federal Register* Solicitations for Submission of Patented Cigarettes

Federal Register, Vol. 51, No. 115, Monday, June 16, 1986:

CONSUMER PRODUCT SAFETY COMMISSION

Interagency Committee on Cigarette and Little Cigar Fire Safety; Request for Samples of Patented, Non-Commercial Cigarettes for Ignition Propensity Testing

AGENCY: Interagency Committee on Cigarette and Little Cigar Fire Safety.

ACTION: Notice

SUMMARY: The Technical Group on Cigarette and Little Cigar Fire Safety invites inventors of cigarettes, which are not produced commercially but which are claimed to have reduced propensity to ignite upholstered furniture and mattresses, to submit samples of such cigarettes for ignition propensity testing. A description of the testing program and how inventors may participate follows.

DATE: Inventors who desire to participate in this testing program should submit samples of cigarette inventions and the information specified in this notice not later than September 30, 1986.

ADDRESS: Samples and information concerning cigarette inventions should be sent to: Dr. Richard G. Gann, Center for Fire Research, National Bureau of Standards, Gaithersburg, Maryland 20899.

FOR FURTHER INFORMATION CONTACT: Mrs. Tawanna Segears, Office of Program Management, Consumer Product Safety Commission, Washington, D.C. 20207; telephone: (301) 492-6554.

SUPPLEMENTARY INFORMATION: The Cigarette Safety Act of 1984 (Pub. L. 98-567, 98 Stat. 2925, October 30, 1984) created the Technical Study Group on Cigarette and Little Cigar Fire Safety (TSG) to investigate the technical and commercial feasibility of developing cigarettes and little cigars with minimum propensity to ignite upholstered furniture and mattresses. The TSG has developed an ignition propensity test and has tested some commercial cigarettes. The TSG also has decided to test the ignition propensity of some cigarettes which are not commercially available but which are claimed by their inventors to have less propensity than commercially available cigarettes to ignite upholstered furniture and mattresses. A limited cigarette ignition propensity testing program will be conducted by the Center for Fire Research at the National Bureau of Standards (NBS) at no charge by NBS to inventors whose inventions are selected for testing. Testing will be blind to the extent possible. **Cigarette inventions which are patented or for which a patent has been filed will be candidates for testing. Cigarette inventions for which a patent has not been issued or for which a patent application has not been filed as of the date of this Federal Register Notice, will not be tested.**

If an inventor desires to have his or her cigarette invention considered for testing on this program, the inventor must:

1. Select the single embodiment of his or her patent(s) believed to be most effective for consideration.
2. Submit documents which show that a patent has been issued or that the application for a patent has been filed.
3. Supply information as to the specific nature of the particular modification or additive employed in the cigarette invention **in quantitative terms.**
4. Provide evidence of significantly reduced propensity of the cigarette invention to ignite substrates found in mattresses and upholstered furniture.
5. Provide free of charge 300 invention cigarettes and 300 control cigarettes that are identical to the invention cigarettes except for the feature that comprises the effective ignition repression. The patented cigarettes and the control cigarettes should be clearly differentiated **on their packages.** The cigarettes should be packed so as to safeguard against damage during transport and should identify a person to contact if the shipment has been damaged.
6. Supply uniformity data (mean value plus standard deviation) for both the patented and control cigarettes with regard to the following properties:

cigarette mass
cigarette length and diameter
mass burning rate (in air)
magnitude of modification (e.g., concentration of additive)

Additionally, the TSG requests inventors submitting cigarettes for testing to provide information showing the absence of any obvious toxicity problems associated with the invention, and an analysis of the tar, nicotine, and carbon monoxide content of the smoke produced by the cigarette invention. However, the failure to provide this information will not preclude consideration of the cigarette invention for testing.

Samples of the cigarette invention, control cigarettes, and the information described above must be received by Dr. Richard G. Gann, Center for Fire Research, National Bureau of Standards, Gaithersburg, Maryland 20899, not later than September 30, 1986. **Materials received after September 30, 1986, will not be accepted.**

Inventors who submit their cigarettes for consideration as candidates for testing are advised that there will be absolutely no payment or reimbursement for the samples of cigarettes provided for testing. These samples will not be returned. Further submission of test sample cigarettes which meet the criteria above does not necessarily mean that the sample cigarettes will be selected for testing. Selection of cigarette inventions for testing will be made by the TSG, whose decision will be final. While the TSG desires to test all cigarette inventions meeting the criteria set forth above, lack of funds, time constraints and other factors may limit the amount of testing which can be done.

The results of this testing program will be included in the TSG's final report to Congress. The TSG will not report results of testing individual cigarette inventions to patent holders. The TSG intends to report results of this testing program in a format which will not disclose results obtained from any individual cigarette invention. Selection of any cigarette invention for testing in this program does not constitute any form of endorsement or approval of the invention by the government of the United States.

Dated: June 3, 1986

Colin B. Church

Federal Employee Designated by the Interagency Committee on Cigarette and Little Cigar Fire Safety.

[FR Doc. 86-13483 Filed 6-13-86; 8:45 am]

Billing Code 6355-01-M

Federal Register, Vol. 51, No. 148, August 1, 1986:

CONSUMER PRODUCT SAFETY COMMISSION

Interagency Committee on Cigarette and Little Cigar Fire Safety; Ignition Propensity Testing of Patented, Non-Commercial Cigarettes

Agency: Interagency Committee on Cigarette and Little Cigar Fire Safety, CPSC.

ACTION: Notice

SUMMARY: In the **Federal Register** of June 16, 1986 (51 FR 21790), the Technical Study Group on Cigarette and Little Cigar Fire Safety (TSG) invited inventors of cigarettes which are not produced commercially but which are claimed to have reduced propensity to ignite upholstered furniture and mattresses to submit samples of such cigarettes for ignition propensity testing. That notice described the testing program and requirements for consideration of cigarette inventions as candidates for testing in this program. That notice specified that only cigarette inventions for which a patent had been issued or for which a patent application had been filed by June 16, 1986, would be eligible for consideration as candidates for testing in this program. The TSG has revised its criteria for selection of candidate inventions to include any cigarette invention for which a patent has been issued or for which a patent application has been filed by September 30, 1986.

FOR FURTHER INFORMATION CONTACT: Colin B. Church, Office of Program Management, Consumer Product Safety Commission, Washington, D.C. 20207; telephone: (301) 492-6554

Dated: July 18, 1986

Colin B. Church

Federal Employee Designated by the Interagency Committee on Cigarette and Little Cigar Fire Safety.

[FR Doc. 86-17348 Filed 7-31-80; 8:45 am]

Billing Code 6355-01-M

U. S. GOVERNMENT PRINTING OFFICE : 1987 O - 193-852

Final Report

Technical Study Group Cigarette Safety Act of 1984