

## ADDENDUM F

REPORT ON THE SOFT X-RAY AND ENERGY DISPERSIVE X-RAY ANALYSIS OF THE CLOTHING OF JOHN F. KENNEDY AND JOHN B. CONNALLY PREPARED BY SOUTHWESTERN INSTITUTE OF FORENSIC SCIENCES, DALLAS, TEX., DATED FEBRUARY 1, 1978



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Office of the Director

February 2, 1978

005090

Mr. Donald A. Purdy, Jr.  
 Staff Counsel  
 Select Committee on Assassinations  
 U.S. House of Representatives  
 3331 House Office Building, Annex 2  
 Washington, D.C. 20515

Dear Mr. Purdy:

Enclosed are the following:

1. The report concerning the examination of J.F.K. and J.B.C. clothing.
2. The soft x-ray films
3. The polaroid photographs of the oscilloscope display.

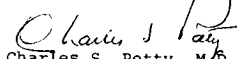
I trust that you will distribute the report to the several members of the Committee. I have discussed it with Doctor Davis already and also am sending a letter regarding it to Doctor Loquvam.

I must stress that there are no duplicates of the polaroid photographs or the x-ray films.

As I recall it it was the understanding that Dallas County would be reimbursed for the film used. How do you want me to make the bill read and to whom should it be addressed? Also, I am anxious to reimburse one of the members of the Institute for the extensive time he put into the analysis of the clothing. As I recall it, I was to bill you for one or two days of my consultation time. Then I can reimburse him for that. Is this satisfactory with you?

Before you set the meeting date in March I would hope that you might contact each of the medical consultants individually. I believe Doctor Davis has something planned for the first or second weekend in March.

Sincerely yours,

  
 Charles S. Petty, M.D.  
 Chief Medical Examiner

CSP:jf  
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**Soft X-ray & Energy Dispersive X-ray Analyses of Clothing**

**J.F.K. and J.B.C.**

**11/10/77 and 11/15/77**

**Southwestern Institute of Forensic Sciences at Dallas**

**Charles S. Petty, M.D.  
Director**

**Report of 2/1/78**

This report details the analyses performed on the clothing of J.F.K and J.B.C. As described in other reports of the Committee of Medical Consultants, the clothing of both J.F.K. and J.B.C. were visually examined at the National Archives on 16 September 1977. Following this preliminary examination, the decision was made to bring the clothing to the Southwestern Institute of Forensic Sciences at Dallas, there to subject the clothing to examination by two different scientific techniques:

1. Soft x-ray (SX)
2. Energy dispersive x-ray (EDX)

Accordingly, the clothing of J.F.K. and J.B.C. were brought to Dallas and the analyses were conducted on two different days, 10 November 1977, and 15 November 1977. The analyses would have been completed on the first day, but one aberrant result obtained during the analysis of the J.B.C. clothing caused me to want to repeat the analysis by EDX. This was done on 15 November 1977, thus the two analysis dates are explained.

Explanation of analytical techniques:

1. Soft x-ray (SX)

This technique employs x-radiation at low energy (10 kilovolts and 2 milliamps). With such low energy, particulate and other material can easily stop x-ray penetration and thus be made visible on the x-ray film. As an example, very tiny metallic fragments, powder particles, and even the weave of textiles can be visualized. This technique cannot be achieved when using ordinary (clinical) x-ray equipment because the energy output of such equipment is much too high.

## 2. Energy dispersive x-ray (EDX)

This technique measures the radiation characteristic of different (chemical) elements when excited by an x-ray source. Thus one element can be distinguished from another, or sorted out from a group of elements. Elements such as lead, copper, zinc, etc. are metallic and heavy and are easily detected and identified by this technique.

### 3. These two different techniques were chosen because:

- a. Both are non-destructive, that is, the garments analyzed are not altered, or destroyed.
- b. Soft x-ray can be readily employed to locate particles of interest (if any) which may then be analyzed using energy dispersive x-ray. In other words, the first technique is used to scan the area of interest and the second can then be employed to focus upon minute areas.

#### Format of results:

##### 1. Soft x-ray (SX)

Actual x-ray films are attached to this report and should be referred to so as to make the explanation more understandable.

###### a. Film #1, J. F.K..

Two different garment views are shown. Both are of the shirt. One view is of the defect area in the back of the shirt, the other shows the two defects in the front of the shirt. The weave of the fabric is easily discerned. The defects show clearly. Clearly shown, also, is the area from which fabric was removed from the back

defect for spectrographic analysis (F.B.I. Laboratory).

b. Film #2, J.F.K.

Two different garments are shown: the back of the coat, and the four-in-hand necktie. In the former the defect shows up well; in the latter, the rub or graze shows less well but can be discerned.

c. Film #1, J.B.C.

Two views of the shirt, showing well both the back and front defects.

d. Film #2, J.B.C.

Two garments are shown: the French cuff area of the shirt, and the thigh area of the trousers. The defects are easy to see.

e. Film #3, J.B.C.

There is one view of the shirt with the back defect well shown.

f. Film #4, J.B.C.

Two views of the coat are included: one shows the defect in the front, the other showing the right coat sleeve.

g. Film #5, J.B.C.

Two views of the coat are included: one shows the right front defect, the other the right back defect.

## 2. Energy dispersive x-ray (EDX)

Two different formats are included: a numerical report which represents the number of counts per 100 seconds for the element which is being analyzed. Thus, the higher the count, the more

of that particular element is present. The other type of report is in the form of polaroid photographs of the oscillograph recording of the 100-second count result for a given element.

a. J.F.K. clothing: nine polaroid photographs are attached.

b. J.B.C. clothing: fourteen polaroid photographs taken 11/10/77, and five polaroid photographs taken 11/15/77 are attached.

All of the polaroid photographs are attached only to illustrate the type of oscillograph representation found, and not to replace the numerical results reported below which are complete. The polaroid photographs alone cannot be used from which to calculate the numerical results.

The numerical results of the EDX analyses are as follows:

a. J.F.K. - analysis date: 11/10/77

<u>Garment</u>	<u>Area</u>	<u>Copper</u>	<u>Lead</u>	<u>Iron</u>	<u>Chromium</u>	<u>Bromine</u>	<u>Zinc</u>
Coat	Defect	874*	478	3302**	7410		
	Control	346	245	431	6561		
Shirt	Back defect	148	201	N.A.	N.A.		
	Collar	255	81	N.A.	N.A.	293	
	Tail	136	35	N.A.	N.A.		
	Rt. front defect	494 <sup>†</sup>	307	N.A.	N.A.		
	Lt. front defect	166	139	N.A.	N.A.		
Tie	Graze	231	70				3872
	Control	240	104				3746

Notes:

\* This is a borderline count, indicative of only a trace of copper.

\*\* Area stained by blood. This accounts for iron present.

<sup>†</sup>This is a borderline count, indicative of only a trace of copper.

## b. J.B.C. - analysis date 11/10/77

<u>Garment</u>	<u>Area</u>	<u>Copper</u>	<u>Lead</u>	<u>Iron</u>	<u>Chromium</u>
Coat	Rt. sleeve control	142	143	212	3498
	Rt. sleeve defect	184	125	239	3470
	Rt. back control	327	127	305	8603
	Rt. back defect	437	190	620	8895
	Rt. front control	9281*	106	103	N.A.
	Rt. front defect	4529**	208	4833 <sup>†</sup>	N.A.
Shirt	Front control	198	11	153	
	Front defect	324	136	610	
	Back control	193	0	162	
	Back defect	185	58	371	
	Cuff control	128	5	160	
	Cuff defect	157	107	196	
Trousers	Control	230	113	5421	
	Defect	270	90	5557	

## c. J.B.C. - analysis date 11/15/77

Coat	Rt. front defect				
	Several layers	3005 <sup>††</sup>	0		
	One layer	4532 <sup>††</sup>	0		
	Above Rt. front defect	550	0		
	Below Rt. front defect	411	0		
	Without lining	420	0		
	With lining	64 <sup>§</sup>	0		

## Notes:

- \* This is aberrant count as proven by repeat analyses five days later.
- \*\* Indicative of copper present in quantity.
- † Blood stains still detectable accounting for iron present.
- †† Indicative of copper. Confirms \*\*.
- § Negative. Confirms suspicions of aberrant count as noted in \* above.

**Discussion:**

The two types of non-destructive analyses were undertaken to:

1. Determine if any particles of missiles still remained on the clothing.
2. To analyze the missile fragments, if any, and to define the elemental nature of them.
3. To see if any correlation might be made between the elements found and missile behavior after striking J.F.K. and J.B.C.

In regard to J.F.K. clothing:

At the periphery of the defect in the back of the shirt some very tiny particles of foreign material are seen on the SX film, but no copper or lead were found by EDX.

On the coat in the area of the defect and on the shirt in the area of the right front defect, the EDX gave a border-line count for copper. Iron, apparently from the blood stain was detected about the defect in the coat.

In regard to J.B.C. clothing:

It should be noted that the clothing had been subjected to dry cleaning at some time after the shootings. The validity of results may therefore be questioned.

One aberrant result, unexplained, possibly due to a misrecording of data or a temporary malfunction of the instrument (EDX) or perhaps an ephemeral contamination, was encountered. Re-analysis of the questioned area proved the aberrance. Copper was found in quantity in the region



of the defect in the right front. The results would indicate that the apparent borderline copper analysis is due to the lining containing some copper. Iron, apparently from blood, was still detectable near the right front defect in the coat, despite dry cleaning.

The analytical results are of interest, because there is proof of very little fragmentation of the missile (missiles) as it (they) passed through the person(s) of J.F.K. and J.B.C. Indeed, the only indication of copper in any quantity was in the region of the front defect of the coat of J.B.C. The term "in quantity" means only that copper was found in clearly detectable amounts by the use of the EDX equipment. The actual amount is very small, and the absence of particulate material on the SX film is not surprising.

I will not discuss further the relationship of these results to speculation or theory, but I would expect that the committee of Medical Consultants will be able to make good use of this information in helping to form a cohesive explanation of the assassination and attempted assassination.

Charles S. Petty, M.D.  
Medical Consultant