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MR. TURNBULL: Witness number 588, please, My Lords, John Scott Orkin.

THE WITNESS: JOHN SCOTT ORKIN, sworn

LORD SUTHERLAND: I notice Advocate Depute, the screens still seem to be operative. I don't know if anything is being fed outside. It shouldn't be, of course.

MR. TURNBULL: If Your Lordships would just give me a moment, I'll confirm.

The appropriate arrangements are in place, My Lords.

LORD SUTHERLAND: There must be a new system in place, then. Very well. Chief turn.

Q For the purposes of these proceedings, are you known as John Scott Orkin?

A That's correct.

Q Are you an officer of the Central Intelligence Agency of the United States of America?

A That's correct.

Q How long have you worked with the Central Intelligence Agency?

A About 30 years.

Q Could you tell us if you have any professional qualifications, please?

A I have a bachelors degree in electrical engineering.

Q And is there a particular function that you

perform within the Central Intelligence Agency?

A My function is to perform the analysis of technical devices used by terrorist organisations.

Q For how long have you performed that function?

A Since 1983.

Q And in examining such devices, do you prepare reports?

A I do.

Q Who else within the Central Intelligence

COPY

Approved for Release: 2021/09/08 C06491302

Approved for Release: 2021/09/08 C06491302

Agency performs such examinations and prepares such reports?
A No one else.
Q And so since 1983 have you examined every such device recovered by the Central Intelligence Agency?
A That's correct, I have.
Q In addition to this experience, are you given the opportunity to examine items gathered by other intelligence agencies?
A There have been occasions where other organisations have submitted devices, yes.
Q And do you exchange reports on items recovered with other intelligence agencies?
A With some, yes.

page 115
Day 071 - 17 November 2000
page 116

Q Are those agencies soley within the United States, or do they include foreign agencies?
A There are some foreign government agencies as well.
Q And is it through a combination of your own examinations and reading of such reports that you build up your expertise?
A That's correct.
Q Can you explain to us, to begin with, please, perhaps, a simplistic matter. How is a timing device used in conjunction with a detonator and an explosive?
A Quite simply, a timing device is used to provide a delay between the time power is applied to the circuitry and the time that power is applied to the detonator to trigger the device.
Q Are there devices other than timers that can be used to detonate explosives?
A There are a number of trigger devices, they can be mechanical devices, contact closure, light sensitive devices, barometric pressure we talked about, radio controlled, remote controlled systems, that sort of thing.
Q All right. In your experience, have you come across timing devices used in conjunction with explosives where the timing device has been adapted

page 116
Day 071 - 17 November 2000
page 117

COPY

Approved for Release: 2021/09/08 C06491302

Approved for Release: 2021/09/08 C06491302

from another appliance?
A Yes.
Q Can you give me some examples of that sort of timing device?
A I think such as kitchen timers, which provide a few minutes to -- and maybe up to 60 minutes time delay, commercial travel alarm clocks can be adapted to that application, wrist watches, new digital wrist watches can be used in that configuration.
Q All right. And on other occasions have you come across the use of custom-made timing devices in conjunction with explosives?
A Yes, several varieties.
Q In your experience, have you come to know a type of timer called the ice cube timer?
A Yes, I am familiar with that.
Q Can I ask you to look, please, at a document on the screen with me, Production 1719, at image 1, please. Perhaps we could expand this. Thank you.
Do you recognise this as the first page of a report prepared by you?
A Yes, that's my report.
Q And does it follow upon your examination of the items described in the report?
A That's right.

page 117
Day 071 - 17 November 2000
page 118

Q And does this report include an analysis of a type of device known as an ice cube timer?
A Yes, there was three devices, one of which was the ice cube timer.
Q Thank you. Is the ice cube timer a custom built or adapted device?
A That's a custom built device.
Q Can can we move to image 2, please. What do we see in the photograph there?
A Yes, that is an ice cube timer.
Q Thank you. And is that the ice cube timer which forms the basis of this report?
A That's correct, yes.
Q Can you read to me, please, from the sentence above the photograph to the end of the page.
A Immediately above the photograph?
Q Yes, please.
A As can be seen, are all crudely potted in an epoxy like material for environmental and mechanical protection.

COPY

Approved for Release: 2021/09/08 C06491302

Approved for Release: 2021/09/08 C06491302

Q And then from the below the photograph?
A Normal operation of the timers would be to connect a battery to the terminals and place the switch in the on position. After the timing cycle is completed, a small incadescent lamp will light and can

page 118
Day 071 - 17 November 2000
page 119

be seen through the transparent potting material. This test phase is very important for these timer designs since it conditions the timing capacitor and will tend to stabilize the time delay as discussed below.
Q And the last --
A After the test, the switch should be turned off, which will reset the timer circuit. The detonator can now be attached to the yellow wires and the device deployed.
Q Thank you. Can we move through, please, to image 4, and to the bottom of the page. Thank you.
And at the bottom of the page are we dealing with timer number 1, as we've just seen in the photograph?
A That's correct.
Q Could you read to me the two paragraphs at the bottom of that page?
A As shown in figure 1, this timer was potted using a very crude mould. The device measures 37 millimetres long, 26 millimeters wide, 23 millimetres high. The weight of the timer is 29 grammes.
Figure 4 shows the ice cube timer after it was depotted.
Q Could I ask you to pause for a second, Mr. Orkin.

page 119
Day 071 - 17 November 2000
page 120

Can I ask you to read a little more slowly, please. You'll appreciate that the evidence is being translated?
A Figure 4 shows the ice cube timer after it was depotted. An etched printed circuit board is used which would require a small laboratory facility to fabricate. The components were mounted and soldered by hand.
Q Can we move now on to the next page, image 5.

COPY

Approved for Release: 2021/09/08 C06491302

Approved for Release: 2021/09/08 C06491302

And do we see there the figure 4 to which you've just referred?

A That's correct. That is the ice cube timer with the potting material removed.

Q Thank you. Could I ask you to read us the text on that page, please.

A The schematic of this timer is shown in figure 5 and is designated a type A timer. The basic time delay is obtained by charging the capacitor C1 through resistor R1. When the voltage across C1 becomes great enough, about 6/10th of a volt, the transistor turns on. This fires the silicone controlled rectifier and applies battery voltage across the two output leads. As shown, an incadescent bulb is across the output and will glow at the end of the

page 120
Day 071 - 17 November 2000
page 121

timing cycle. This serves as a test of proper circuit operation. Note that the switch in the off position discharges C1 so that a new timing cycle can be started immediately after the test. Operation current for timer number 1 was approximately 1.8 microampers.

Q And have you then drawn something below the text that you've just read?

A Yes, figure 5 is the schematic diagram for that timer.

Q Thank you. Can you help me to understand the type of electronics employed by this timer?

A Quite simply, the time delay is based on slowly charging capacitor through -- the capacitor C1 through a very large resistor R1, which allows a very small current to flow, and the larger the capacitor, the larger the resistor, the larger the time that it takes to charge up.

As an analogy, I used a -- the idea of a cup that is slowly being filled with water, okay. So think of a -- just a trickle of water slowly going into the cup. When the cup fills, then the output can fire and trigger the device. The problem with these devices is that the capacitytors have a problem with what we call leakage current, so think of a small pinhole in the bottom of the cup. Some of the water is dripping. So

page 121
Day 071 - 17 November 2000
page 122

COPY

Approved for Release: 2021/09/08 C06491302

Approved for Release: 2021/09/08 C06491302

it takes a little longer to fill the cup because of that. But it also limits the maximum amount of time delay that you can achieve with this kind of a device.

Q Do some timers employ what's known as a digital electronics?

A Some timers do. This is not.

Q What type of electronics is this?

A This is simply analog electronics.

Q Did you say that there was a printed circuit board used in connection with this timer?

A Yes, a very simple one.

Q Do we see it in figure 4?

A We see the top of the circuit board, the components are mounted on it.

Q How sophisticated was the circuit board?

A Fairly simple. It's the sort of thing that could be made in any small electronics shop, or even -- even in a hobbyist type configuration.

Q Is the time delay available with the ice cube timer adjustable?

A It's somewhat adjustable at time of assembly by the selection of the values of the capacitor and the resistor. It's limited to generally less than 60 minutes.

Q I see. And once constructed, is it

page 122
Day 071 - 17 November 2000
page 123

thereafter capable of being adjusted?

A No. It's not adjusted by the user at all.

Q Does this type of timer provide an accurate delay period?

A Not really, because of the problem of the leakage that I alluded to. That is susceptible to changing with the age of the components, of the temperature of the components, and several other factors so that -- it's not very reliable time delay.

Q Is this type of timer affected by the temperature change within its environment?

A I'm sorry, by the temperature?

Q Change within its environment?

A Yes, very much so.

Q I see. Is it a stable timing device, then?

A No. Even repetitive operations will provide different times during by -- as much as a couple of minutes ^.

Q Can I ask you to look back with me at the first page of this report, image 1.

COPY

Approved for Release: 2021/09/08 C06491302

Approved for Release: 2021/09/08 C06491302

Do we see that in the paragraph headed "conclusions", you tell us that none of the timers provides an accurate time delay?
A That's correct.
Q Large variations in timing can be expected of

page 123
Day 071 - 17 November 2000
page 124

the designs used in these timers, one timer provided a delay of 2.7 hours on the first test, followed by a delay of only 29 minutes on the second test.
Did you perform timing tests for the number 1 ice cube timer that we've been discussing?
A Yes, I did. They should be a part of that report.
Q Could we look to image 6, please. And do we see at the top of the page --
A At the top of the page.
Q Could we have the page a little further down. Thank you.
I am sorry. My mistake. Scroll up. Can we see right to the top of the page.
Do we see there that you've tabulated the results of the timing tests using this timer?
A That's right. This is for the ice cube timer.
Q Could you read those to us, please?
A Maximum time was 54.5 minutes. The minimum time achieved was 23.6 minutes. And then that's followed by the effects of temperature, nominal 39 minutes at room temperature. It went -- stayed close to that, at 0 degrees centigrade to 38.7 minutes, but 15 degrees centigrade it rose to 62.3 minutes.

page 124
Day 071 - 17 November 2000
page 125

Q Are you aware from your experience of occasions on which an ice cube timer has been used in conjunction with another device, such as a barometer?
A My only knowledge of that is the device that was recovered in Germany in 1988.
Q Is that what you would understand to be the Autumn Leaves inquiry?
A Yes.
Q Thank you. Can you understand what the purpose of using an ice cube timer in conjunction with

COPY

Approved for Release: 2021/09/08 C06491302

Approved for Release: 2021/09/08 C06491302

a barometric device would be?
A My understanding would be to guarantee that the target, being an aeroplane, was airborne before the timer was started.
Q I see. And why would the ice cube timer on its own not be sufficient for that purpose?
A Well, the time delay being as short as it is, there probably would not be time to -- between the time that it was introduced into the aircraft for the aircraft to even become airborne.
Q I see.
A Before it discharged.
Q By the 1980s, were digital timers available?
A Yes, very much so.
Q Was it common for you to be asked to examine

page 125
Day 071 - 17 November 2000
page 126

digital timers --
A From the mid-1980s we saw several varieties of digital timers.
Q Can I ask you to look for me, please, at Label 595. Do you recognise that type of object?
A That certainly looks like a variety of the ice cube timer.
Q Thank you. Can I ask you to look at a circuit diagram that was drawn by a scientist who examined that timer, Production 1665, image D1, please.
And is it possible, operator, to also show us Production 1719, image 5.
Now, we see -- thank you. We can see to the right of the screen the circuit diagram that you mentioned a moment or two ago?
A That's correct.
Q Can you now look at the other circuit diagram and tell me whether or not it is the same as yours?
A Yes, they are both the same.
Q Thank you. Can we close those productions, please, and ask I ask you now to look at Label 420.
Well, if it's not here, it doesn't matter. Let me do it another way.
Can I ask you to look at Production 284, at

page 126
Day 071 - 17 November 2000
page 127

COPY

Approved for Release: 2021/09/08 C06491302

Approved for Release: 2021/09/08 C06491302

image 1, please.
Do you recognise this as another report prepared by you?
A Yes.
Q And if you look to image 2, do we see there photographs of the timer that's the subject of this report?
A Yes, indeed.
Q Was there a particular geographical name that you referred to this timer by?
A The Togo timer. That's where it was recovered.
Q Thank you. Can we go back to image 1. And can I ask you to read to me the summary and conclusions on the front of the page.
A The timer generates accurate, crystal/ controlled delays over a range of 1 to 99 minutes in one minute steps or 1 to 99 hours in 1 hour steps. Design and assembly are generally professional, suggesting a well-equipped facility and trained personnel were used. Two errors were made in the printed circuit board routing, but only one was caught and repaired (a well-done repair). The other error can cause, at most, a 6 second error in the delay. Surface mount components predominate. Physical space and

circuit trace provisions exist to expand the range from 2 decades, meaning 1 to 99, up to 4 decades, should be 1 to 9999, but the required components are not installed. Whether this is a modified commercial or a custom device, cannot be determined.
Q When did you prepare this report, Mr. Orkin?
A This was prepared early 1988.
Q I see. What did you mean by that last sentence that you've just read to us?
A We had seen some kit timer, electronic kits that were available to hobbyist to build, and we thought that perhaps this might be one of those.
Q I see. And what did you have in mind when you used the term whether this is a modified commercial or a custom device can't be determined?
A That sort of a thing is a commercial kit that was available to purchase over the counter.
Q I see. Can I ask you to look with me at image 3, please.
And did we see a photograph now showing an

COPY

Approved for Release: 2021/09/08 C06491302

Approved for Release: 2021/09/08 C06491302

internal view of the timer?
A Yes.
Q Could you read to me the text above the photograph.
A A smaller printed circuit board is mounted

page 128
Day 071 - 17 November 2000
page 129

directly --
Q I'm sorry. From the very top. From the first line?
A From the top.
Control switches and labels are on the front panel. Each label is etched copper, identical to a circuit trace (except no components are connected). Solder mask covers the entire panels. The controls are: 2 thumbwheel switches labelled TIME. One slide switch labelled on/off, one slide switch labelled hours/minutes. One push button momentary contact switch labelled TEST. One red Light Emitting Diode or LED path inside surface of the front panel has circuit traces etched and surface mount components installed. Solder mask also covers this surface. Traces of conductor along the edges indicate shear lines were made when the conductor pattern was etched. These sheer lines indicate where the board is to be cut.
A smaller printed circuit board is mounted directly to the thumbwheel switches. As seen in figure 3, this board is a different colour, lighter, and has no solder mask. And again surface mount components are installed.
Q Thank you. What type of electronics are employed in this timer?

page 129
Day 071 - 17 November 2000
page 130

A This is a digital circuit.
Q Is it variable delay available with this timer?
A Yes, it's user selectable by the thumbwheel switches on the front panel.
Q Is it an accurate timer?
A Very accurate, to within 10th of second over many hours of delay.
Q Is it protected by its surrounding temperature?

COPY

Approved for Release: 2021/09/08 C06491302

Approved for Release: 2021/09/08 C06491302

A Not really, because of the crystal control ^.
Q You mentioned that surface mount technology was used. How modern was circuit mount technology in 1988?
A At that time it was fairly new, state of the art.
Q And you mentioned that solder mask had been applied to the printed circuit board?
A Yes, both sides had the green solder masking applied.
Q Is this what you would term an adapted device or a custom built device?
A Looking back at it today, it's a custom built device.
Q Can I now ask you to bring yourself up to

page 130
Day 071 - 17 November 2000
page 131

date and to think back over the years of experience that you've had with me. Have you seen more than one time of ice cube timer in your years of experience?
A We've seen varieties in the physical size and shape of ice cube timers. Generally the same type of thing.
Q I see. Have you ever seen an ice cube timer that used solder mask on the board?
A No, never.
Q Is it even proper or accurate to call what's within the ice cube timer a printed circuit board?
A Yes, it is a circuit board, but it's a fairly simple one.
Q Is the board in the ice cube timer printed?
A I believe so, yes.
Q All right. Before preparing the report on the timer that we see on the screen, had you ever encountered a custom built timing device that employed solder mask?
A No, not a timer with solder masking.
Q And since preparing this report that's on the screen in 1988, have you ever since encountered a custom built timing device that employed solder mask?
A No, I haven't seen one since then, besides the MST-13.

page 131
Day 071 - 17 November 2000
page 132

COPY

Approved for Release: 2021/09/08 C06491302

Approved for Release: 2021/09/08 C06491302

Q This timer you called the MST-13, did you see photographs, Production 272, at one stage? Could we see Production 272, please. Image 8, please.
Do you remember seeing this amongst a group of other photographs?
A Yes. Yes. These were field photographs.
Q Yes. And did you understand that they were taken in Senegal?
A That's correct.
Q And do they also show an MST-13 timer?
A They show the MST-13 timer more as we expected to see it.
Q And what do you mean by that?
A In that it has all four thumbwheel switches installed on the front panel, the corners have been cut out on the cut lines that were indicated on the circuit board to be able to place it into a plastic box.
Q Yes. Now, apart from the MST-13 timer that features in your report and these photographs, have you ever seen another MST-13?
A No, only these two are the only two I've seen.
Q Have you ever been asked to examine a further recovered sample?
A No. Only the one.

page 132
Day 071 - 17 November 2000
page 133

Q And have you ever seen a report of the examination of an MST-13 timer by any other agency?
A No.
Q Could you look for me at Label 420 now, please. And is that the timer that features in your report?
A It certainly looks like it.
Q Thank you. Can I ask you, then, to consider something with me. Can I you to consider with me, on the one hand, an ice cube timer like the one I showed you just a few moments ago and, on the other hand, an MST-13 timer. Which of the two would provide the longer delay?
A The MST will provide a much longer delay, up to almost 10,000 hours delay, as opposed to less than an hour for an ice cube timer.
Q Which of the two would be more accurate?
A The MST-13 would be far more accurate, because it's crystal controlled.
Q And which of the two would be more stable?

COPY

Approved for Release: 2021/09/08 C06491302

Approved for Release: 2021/09/08 C06491302

A The MST-13 would be more stable.
Q And does it follow from that, that one or other would be more reliable?
A I would think the MST would be much more reliable.

page 133
Day 071 - 17 November 2000
page 134

Q Would either one of the two provide more safety to the user?
A Yes, because the inherent unpredictability of the ice cube time are makes it very hazardous to use.
Q Thank you. If you wanted to hide an electronic timing device within some other object, is there a particular type of object that would spring to mind as providing a good camouflage for it?
A The best place to hide an electronic circuit is within an electronic circuit, where you would expect to see other components, such as a portable radio or cassette player or something like that.
Q Yes. And is that because that's a device that has its own electronic components?
A Exactly.
Q Thank you.
LORD SUTHERLAND: Mr. Taylor.
MR. TAYLOR: No thank you, My Lord.
LORD SUTHERLAND: Mr. Keen.
CROSS-EXAMINATION BY MR. KEEN:
Q I take it, Mr. Orkin that virtually every electronic base on the market now and indeed in the late 1980s would contain an electrical circuit?
A By definition, sir.
Q And therefore an electrical circuit board?

page 134
Day 071 - 17 November 2000
page 135

A I have seen devices without a circuit board.
Q They are few and far between?
A Very far.
Q Yes. Thank you, Mr. Orkin?
MR. TURNBULL: I have no re-examination, My Lords.
LORD SUTHERLAND: Thank you, Mr. Orkin. That's all?
A Thank you, My Lord.

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