

Appendix A

Visual Basic Code for the SAFE Model

The following is the code from the SAFE Model that simulates the probability decision tree from the Effectiveness Model.

Select Case NumDevices

Case 1

FA(1) = Device(Order(1)).ProbFA * NonThreat

TA(1) = Device(Order(1)).ProbDet * Threat

FC(1) = (1 - Device(Order(1)).ProbDet) * Threat

TC(1) = (1 - Device(Order(1)).ProbFA) * NonThreat

FalseAlarm = FA(1)

TrueAlarm = TA(1)

FalseClear = FC(1)

TrueClear = TC(1)

TotalCost = (CostFA * FA(1)) + (CostFC * FC(1)) + (NumBags *
Device(Order(1)).Cost)

Case 2

FA(1) = Device(Order(1)).ProbFA * NonThreat

TA(1) = Device(Order(1)).ProbDet * Threat

FC(1) = (1 - Device(Order(1)).ProbDet) * Threat

$$TC(1) = (1 - \text{Device}(\text{Order}(1)).\text{ProbFA}) * \text{NonThreat}$$

$$FA(2) = \text{Device}(\text{Order}(2)).\text{ProbFA} * TC(1)$$

$$TA(2) = \text{Device}(\text{Order}(2)).\text{ProbDet} * FC(1)$$

$$FC(2) = (1 - \text{Device}(\text{Order}(2)).\text{ProbDet}) * FC(1)$$

$$TC(2) = (1 - \text{Device}(\text{Order}(2)).\text{ProbFA}) * TC(1)$$

$$\text{FalseAlarm} = (FA(1) + FA(2))$$

$$\text{TrueAlarm} = (TA(1) + TA(2))$$

$$\text{FalseClear} = FC(2)$$

$$\text{TrueClear} = TC(2)$$

$$\text{TotalCost} = (\text{CostFA} * (FA(1) + FA(2))) + (\text{CostFC} * FC(2)) + (\text{NumBags} * \text{Device}(\text{Order}(1)).\text{Cost}) + ((TC(1) + FC(1)) * \text{Device}(\text{Order}(2)).\text{Cost})$$

Case 3

$$FA(1) = \text{Device}(\text{Order}(1)).\text{ProbFA} * \text{NonThreat}$$

$$TA(1) = \text{Device}(\text{Order}(1)).\text{ProbDet} * \text{Threat}$$

$$FC(1) = (1 - \text{Device}(\text{Order}(1)).\text{ProbDet}) * \text{Threat}$$

$$TC(1) = (1 - \text{Device}(\text{Order}(1)).\text{ProbFA}) * \text{NonThreat}$$

$$FA(2) = \text{Device}(\text{Order}(2)).\text{ProbFA} * TC(1)$$

$$TA(2) = \text{Device}(\text{Order}(2)).\text{ProbDet} * FC(1)$$

$$FC(2) = (1 - \text{Device}(\text{Order}(2)).\text{ProbDet}) * FC(1)$$

$$TC(2) = (1 - \text{Device}(\text{Order}(2)).\text{ProbFA}) * TC(1)$$

$$FA(3) = \text{Device}(\text{Order}(3)).\text{ProbFA} * (FA(1) + TC(2))$$

$$TA(3) = \text{Device}(\text{Order}(3)).\text{ProbDet} * (TA(1) + FC(2))$$

$$FC(3) = (1 - \text{Device}(\text{Order}(3)).\text{ProbDet}) * (TA(1) + FC(2))$$

$$TC(3) = (1 - \text{Device}(\text{Order}(3)).\text{ProbFA}) * (FA(1) + TC(2))$$

$$\text{FalseAlarm} = (FA(2) + FA(3))$$

$$\text{TrueAlarm} = (TA(2) + TA(3))$$

$$\text{FalseClear} = (FC(3))$$

$$\text{TrueClear} = (TC(3))$$

$$\text{TotalCost} = (\text{CostFA} * (FA(2) + FA(3))) + (\text{CostFC} * FC(3)) + (\text{NumBags} * \text{Device}(\text{Order}(1)).\text{Cost}) + ((TC(1) + FC(1)) * \text{Device}(\text{Order}(2)).\text{Cost}) + (FA(1) + TA(1) + TC(2) + FC(2)) * \text{Device}(\text{Order}(3)).\text{Cost}$$

Case 4 To 25

$$FA(1) = \text{Device}(\text{Order}(1)).\text{ProbFA} * \text{NonThreat}$$

$$TA(1) = \text{Device}(\text{Order}(1)).\text{ProbDet} * \text{Threat}$$

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FC(1) = (1 - Device(Order(1)).ProbDet) * Threat
TC(1) = (1 - Device(Order(1)).ProbFA) * NonThreat
FA(2) = Device(Order(2)).ProbFA * TC(1)
TA(2) = Device(Order(2)).ProbDet * FC(1)
FC(2) = (1 - Device(Order(2)).ProbDet) * FC(1)
TC(2) = (1 - Device(Order(2)).ProbFA) * TC(1)

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FA(3) = Device(Order(3)).ProbFA * (FA(1) + TC(2))
TA(3) = Device(Order(3)).ProbDet * (TA(1) + FC(2))
FC(3) = (1 - Device(Order(3)).ProbDet) * (TA(1) + FC(2))
TC(3) = (1 - Device(Order(3)).ProbFA) * (FA(1) + TC(2))

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TotalCost = (NumBags * Device(Order(1)).Cost) + ((TC(1) + FC(1)) *
Device(Order(2)).Cost) + (FA(1) + TA(1) + TC(2) + FC(2)) *
Device(Order(3)).Cost

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N = 4

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Do While (N <= NumDevices)

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    If (N = 4) Or (N = 6) Or (N = 8) Or (N = 10) Or (N = 12) Or (N = 14) Or
(N = 16) Or (N = 18) Or (N = 20) Or (N = 22) Or (N = 24) Then

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        FA(N) = Device(Order(N)).ProbFA * (FA(N - 2) + TC(N - 1))
        TA(N) = Device(Order(N)).ProbDet * (TA(N - 2) + FC(N - 1))
        FC(N) = (1 - Device(Order(N)).ProbDet) * (TA(N - 2) + FC(N - 1))
        TC(N) = (1 - Device(Order(N)).ProbFA) * (FA(N - 2) + TC(N - 1))

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        TotalCost = TotalCost + ((FA(N - 2) + TC(N - 1) + TA(N - 1) +
FC(N - 1)) * Device(Order(N)).Cost)

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        N = N + 1

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    Else

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        FA(N) = Device(Order(N)).ProbFA * (FA(N - 2) + TC(N - 1))
        TA(N) = Device(Order(N)).ProbDet * (TA(N - 2) + FC(N - 1))
        FC(N) = (1 - Device(Order(N)).ProbDet) * (TA(N - 2) + FC(N - 1))
        TC(N) = (1 - Device(Order(N)).ProbFA) * (FA(N - 2) + TC(N - 1))

```

```

        TotalCost = TotalCost + ((FA(N - 2) + TC(N - 1) + TA(N - 2) +
FC(N - 1)) * Device(Order(N)).Cost)

```

```

        N = N + 1

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    End If

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FalseAlarm = FA(N - 2) + FA(N - 1)

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$$\text{TrueAlarm} = \text{TA}(\text{N} - 2) + \text{TA}(\text{N} - 1)$$
$$\text{FalseClear} = \text{FC}(\text{N} - 1)$$
$$\text{TrueClear} = \text{TC}(\text{N} - 1)$$
$$\text{NewTotalCost} = \text{TotalCost} + (\text{CostFA} * \text{FalseAlarm}) + (\text{CostFC} * \text{FalseClear})$$

Loop

End Select