Mission Capable (MC %)

FORECAST

USING RELIABILITY CALCULATOR

Test & Tutorial

As of 11st Feb. 2021

FMC FORECAST USING RELIABILITY (5 ข้อ)

แบบฝึกหัด FMC FORECAST USING RELIABILITY

Given:

MC (Mission Capable %) = PMC (Partial Mission Capable %) + FMC (Full Mission Capable %)

H(t) = Aircraft Reliability = MC / 100 = (PMC / 100) + (FMC / 100)

$H(t) = e^{-\lambda t}$; whereas e = natural log = 2.718281828, λ = Failure Rate and t = time (or flying hours)

$Ln(H(t)) = Ln(e^{-\lambda t}) = -\lambda t$ or Failure Rate $\lambda = Ln(H(t)) / -t$

Use the above given statements and empirical formulas to answer the following questions:

1. An aircraft fleet has flown 1 year with an average FMC of 70 % and an average PMC of 8 %. What is the aircraft reliability H(t) of that year ?

a. 0.70

b. 0.78

c. 0.80

d. 0.62

2. An aircraft fleet has flown 1 year with an average PMC of 5 % and the reliability of 0.75. What is the FMC (%) of this aircraft fleet ?

a. 60 %

b. 65 %

c. 70 %

d. 75 %

3. An aircraft fleet has flown 1 year with an average FMC of 72 % and the reliability of 0.72. What is the PMC (%) of this aircraft fleet ?

a. 0 %

b. 5 %

c. 8 %

d. 10 %

4. Given: Failure Rate $\lambda = Ln(H(t)) / -t$ ..... and $H(t) = e^{-\lambda t}$

An aircraft fleet has flown 2,800 flying hours in year 2020 with an average MC of 66 %. This aircraft fleet is planned to fly 3,000 flying hours in year 2021. What is the aircraft MC forecast in the year 2021 ?

a. $\lambda_1 = Ln(0.66) / (3{,}000)$; $MC_{year2021} = e^{-\lambda_1 * 2{,}800}$

b. $\lambda_1 = Ln(0.34) / (3{,}000)$; $MC_{year2021} = e^{-\lambda_1 * 2{,}800}$

c. $\lambda_1 = Ln(0.66) / (2{,}800)$; $MC_{year2021} = e^{-\lambda_1 * 3{,}000}$

d. $\lambda_1 = Ln(0.34) / (2{,}800)$; $MC_{year2021} = e^{-\lambda_1 * 3{,}000}$

5. Given: Failure Rate $\lambda = Ln(H(t)) / -t$ ..... and $H(t) = e^{-\lambda t}$

An aircraft fleet has flown 5,500 flying hours in year 2020 with an average MC of 72 %. This aircraft fleet is planned to fly 6,000 flying hours in year 2021. What is the aircraft MC forecast in the year 2021 ?

a. $\lambda_1 = Ln(0.72) / (5{,}500)$; $MC_{year2021} = e^{-\lambda_1 * 6{,}000}$

b. $\lambda_1 = Ln(0.72) / (6{,}000)$; $MC_{year2021} = e^{-\lambda_1 * 5{,}500}$

c. $\lambda_1 = Ln(0.72) / (6{,}000)$; $MC_{year2021} = e^{-\lambda_1 * 5{,}500}$

d. $\lambda_1 = Ln(0.72) / (5{,}500)$; $MC_{year2021} = e^{-\lambda_1 * 6{,}000}$

Given Data

MC (Mission Capable %) = PMC (Partial Mission Capable %) + FMC (Full Mission Capable %)

R(t) = Aircraft Reliability = MC / 100 = (PMC / 100) + (FMC / 100)

$R(t) = e^{-\lambda t}$; whereas e = natural log = 2.718281828, λ = Failure Rate and t = time (or flying hours)

$Ln(R(t)) = Ln(e^{-\lambda t}) = -\lambda t$ or Failure Rate $\lambda = Ln(R(t)) / -t$

ทฤษฎีและหลักการที่เกี่ยวข้อง

กรมช่างอากาศ
Directorate Of Aeronautical Engineering

1. ความพร้อมปฏิบัติการ ของอากาศยาน ทอ. = MC% = FMC% + PMC% (FY 2020)
2. ความเชื่อถือได้ (Reliability) ในการปฏิบัติการของอากาศยาน R(t) = MC%/100 = (FMC%+PMC%)/100
3. Reliability; R(t) = EXP(-λ*t) หรือ R(t) = e ^ - (λ * t)
4. λ = Failure Rate , t = Flying Hours (YR 2020) , e = 2.7182818281828...
5. Ln(R(t)) = Ln(EXP(-λ*t))
6. Ln(R(t)) = -λ*t
7. λ = Ln(R(t))/(-t)
8. MC% FORECAST (YR 2021) = R(t) *100 = e ^ - (λ * t) *100 , t = Flying Hours (FY 2021)

Use the above given statements and empirical formulas to answer the following questions:

1. An aircraft fleet has flown 1 year with an average FMC of 70 % and an average PMC of 8 %.

What is the aircraft reliability R(t) of that year ?

a. 0.70

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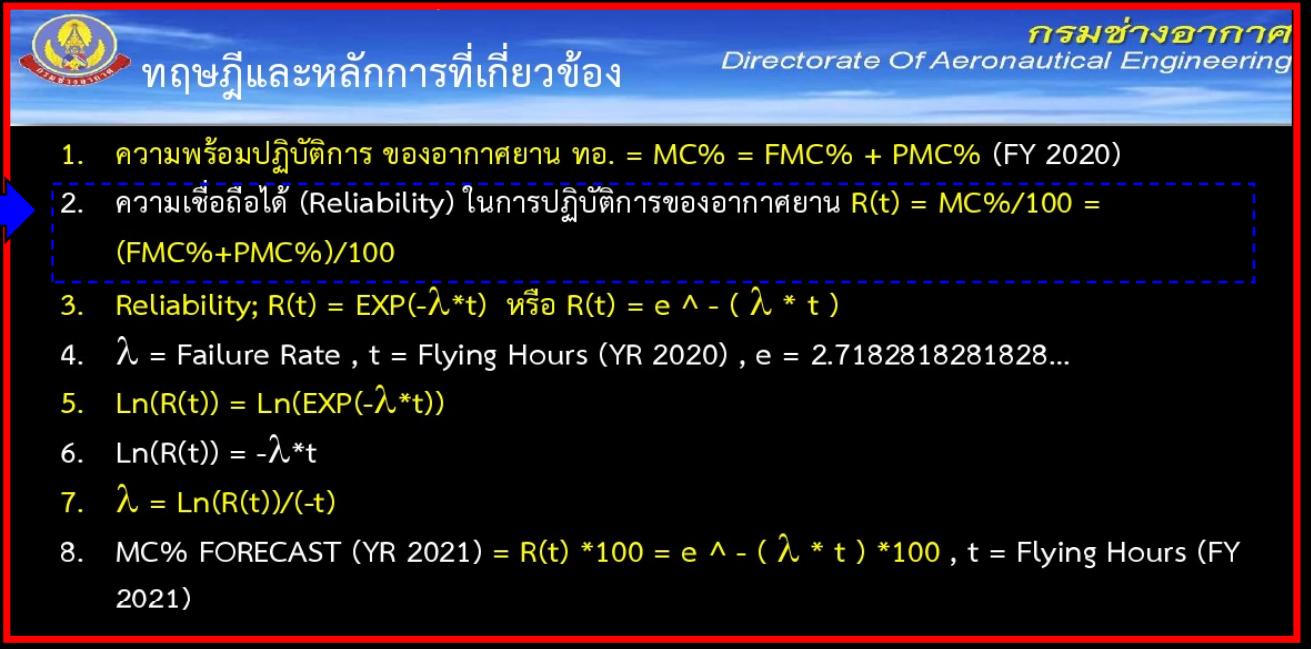

ความเชื่อถือได้ (Reliability) ในการปฏิบัติการของอากาศยาน R(t) = MC%/100 = (FMC%+PMC%)/100

จากโจทย์ FMC = 70%

PMC = 8%

จาก R(t) = MC%/100 = (FMC%+PMC%)/100

ดังนั้น ความเชื่อถือได้ (Reliability) ในการปฏิบัติการของอากาศยาน R(t) = MC%/100 = (70+8)/100 = 0.78

2. An aircraft fleet has flown 1 year with an average PMC of 5 % and the reliability of 0.75. What is the FMC (%) of this aircraft fleet ?

a. 60 %

b. 65 %

c. 70 %

d. 75 %

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ความเชื่อถือได้ (Reliability) ในการปฏิบัติการของอากาศยาน R(t) = MC%/100 = (FMC%+PMC%)/100

จากโจทย์ PMC = 5%, R(t) = 0.75

จาก R(t) = MC%/100 = (FMC%+PMC%)/100

แทนค่า 0.75 = MC%/100 = (FMC% + 5)/100

ดังนั้น FMC% = (0.75 x 100) – (5) = 70

3. An aircraft fleet has flown 1 year with an average FMC of 72 % and the reliability of 0.72. What is the PMC (%) of this aircraft fleet ?

a. 0 %

b. 5 %

c. 8 %

d. 10 %

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7. $\lambda = Ln(R(t))/(-t)$
8. MC% FORECAST (YR 2021) = $R(t) *100 = e^{-(\lambda * t)} *100$, t = Flying Hours (FY 2021)

ความเชื่อถือได้ (Reliability) ในการปฏิบัติการของอากาศยาน R(t) = MC%/100 = (FMC%+PMC%)/100

จากโจทย์ FMC = 72%, R(t) = 0.72

จาก R(t) = MC%/100 = (FMC%+PMC%)/100

แทนค่า 0.72 = MC%/100 = (72 + PMC%)/100

ดังนั้น PMC% = (0.72 x 100) – (72) = 0

4. Given: Failure Rate λ = Ln(R(t)) / -t ..... and $R(t) = e^{-\lambda t}$

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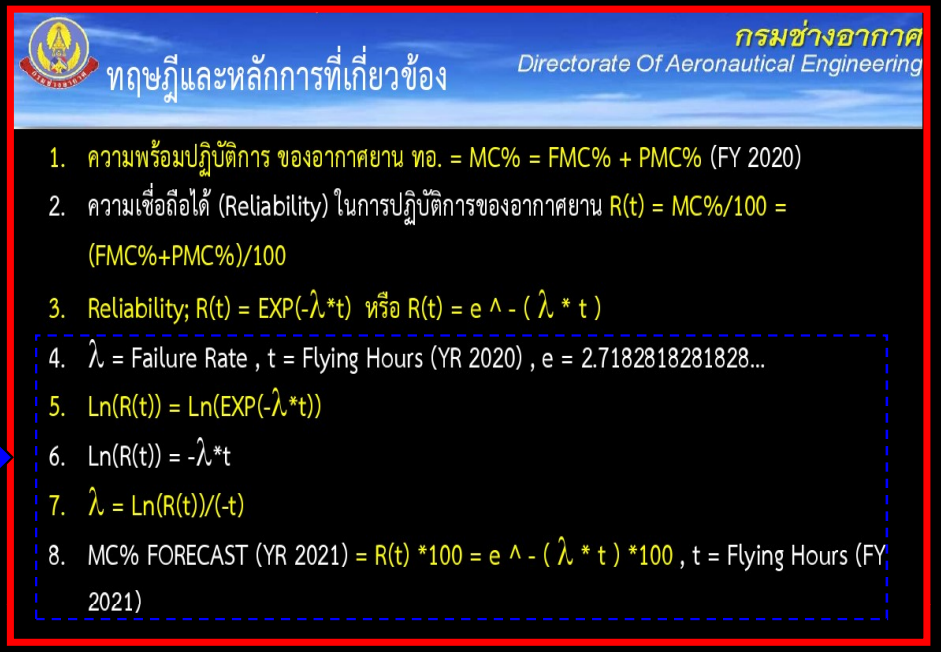

λ = Ln(R(t))/(-t), λ = Failure Rate , t = Flying Hours (YR 2020) , e = 2.7182818281828...

MC% FORECAST (YR 2021) = R(t) = e ^ - (λ * t) , t = Flying Hours (FY 2021)

จากโจทย์ YEAR 2020 : Has flown 2,800 FH., MC = 66%

YEAR 2021 : 3,000 FH. (as planned), MC% FORECAST = ?

ดังนั้น λ_1 = Ln(R(t))/(-t) = Ln(0.66)/(-2,800), t = Flying Hours (FY 2020)

ดังนั้น MC% FORECAST (YR 2021) = R(t) = e ^ - (λ_1 * 3,000) , t = Flying Hours (FY 2021)

5. Given: Failure Rate λ = Ln(R(t)) / -t ..... and R(t) = $e^{-\lambda t}$

An aircraft fleet has flown 5,500 flying hours in year 2020 with an average MC of 72 %. This aircraft fleet is planned to fly 6,000 flying hours in year 2021. What is the aircraft MC forecast in the year 2021 ?

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c. λ_1 = Ln(0.72) / (- 6,000); $MC_{year2021} = e^{-(\lambda_1 * 5{,}500)}$

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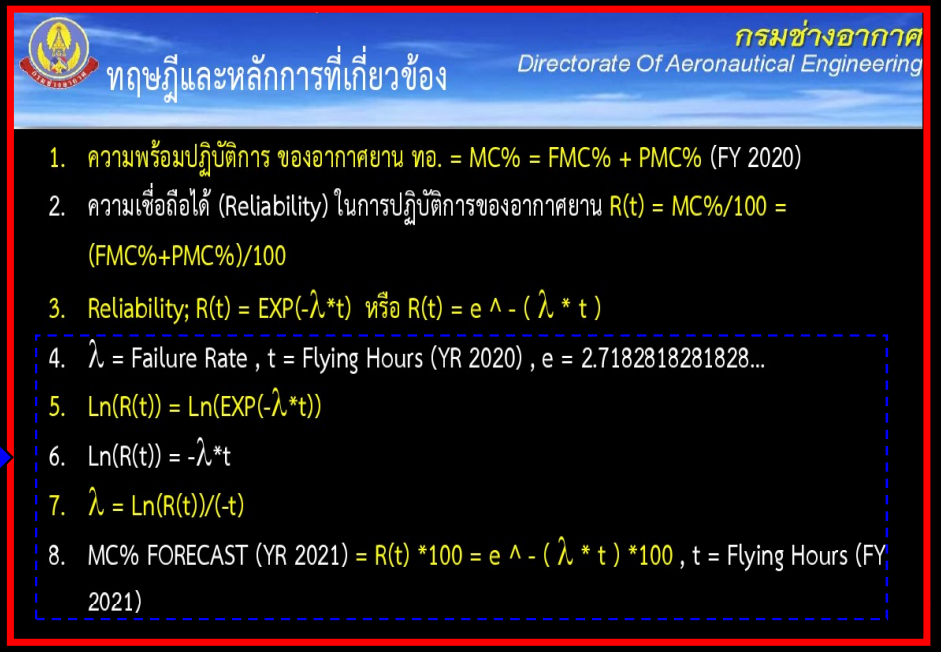

λ = Ln(R(t))/(-t), λ = Failure Rate , t = Flying Hours (YR 2020) , e = 2.7182818281828...

MC% FORECAST (YR 2021) = R(t) = e ^ - (λ * t) , t = Flying Hours (FY 2021)

จากโจทย์ YEAR 2020 : Has flown 5,500 FH., MC = 72%

YEAR 2021 : 6,000 FH. (as planned), MC% FORECAST = ?

ดังนั้น λ_1 = Ln(R(t))/(-t) = Ln(0.72)/(-5,500), t = Flying Hours (FY 2020)

ดังนั้น MC% FORECAST (YR 2021) = R(t) = e ^ - (λ_1 * 6,000) , t = Flying Hours (FY 2021)

Mission Capable (MC %)

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