



Evaluating the effectiveness of digital Radiographic Testing method in Detection of defects on air craft landing gears.



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1. Introduction

Aerospace transportation industry is one of the industries that bring about better economy in the world and therefore there is:

- a high demand of maintaining the structural integrity on each and every components within an air craft inclusive of landing gears.
- A landing gear is a structure in an aircraft which is installed for the purpose of supporting the weight and allows the aircraft to land safely



Introduction Continues...

- construction of landing gears due to their light density of about 2.7 g/cm^3 ,
- high strength and
- resistance to oxidation.



Introduction Continues...

Landing gear failure may occur due to:

- parts worn beyond their allowable service limits,
- use of non-standard parts
- and fatigue of parts which may lead to hard landing.



2. Theoretical development.

- The images of digital radiography are better since software data can be manipulated [1].
- Direct digital radiography portrays a lower resolution, dynamic range, noise-limited contrast, and a high initial cost [2].



Theoretical development.

Cont...

- Digital radiography also comply with 'as low as reasonably achievable' (ALARA) principles since the exposure time is reduced and safety is enhanced [3].
- The inspection of aluminium aerospace components requires a reasonably lower penetration power with higher resolution than that of steel.



Theoretical development. Cont...

- Factors such as x-ray source, detector type, the test component and angle of scanning determine the mathematical model of the image that is generated digitally [4].



3. Experiments

- an x-tek digital radiographic testing system micro-focal 160 kV x-ray machine,
- an installed direct conversion.
- a rotating base of 360 degree revolution
- and a stabilised min-focus radiographic x-ray generator



Experiments continues...

- The experiments had varied the x-ray penetration power levels into :
- 102kVp, 120kVp, 140kVp, and 160kVp,
- while the intensity was kept constant at 300 μ As





- Positioning



Induced defect.



4. Results and discussion.

- Component positioned and evaluated at 90 degrees to the emission of x-ray beam, **the induced discontinuity was not detectable.**
- after 20 degrees of rotation, the image of the discontinuity was then visible.



Image results

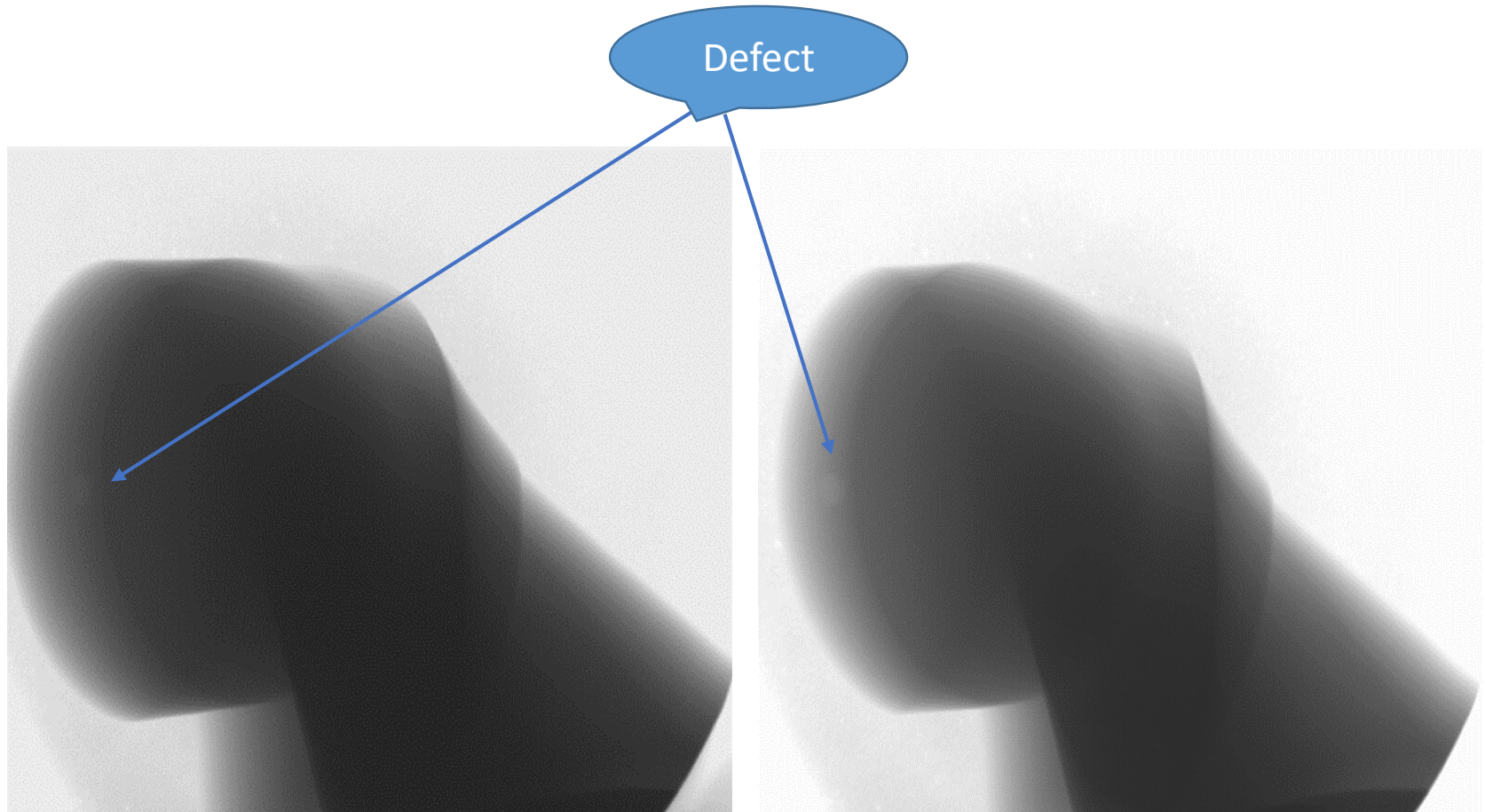


Figure1: Digital image of landing gear at 102 kV

Figure2: Digital image of landing gear at 120 kV.



Image results continues

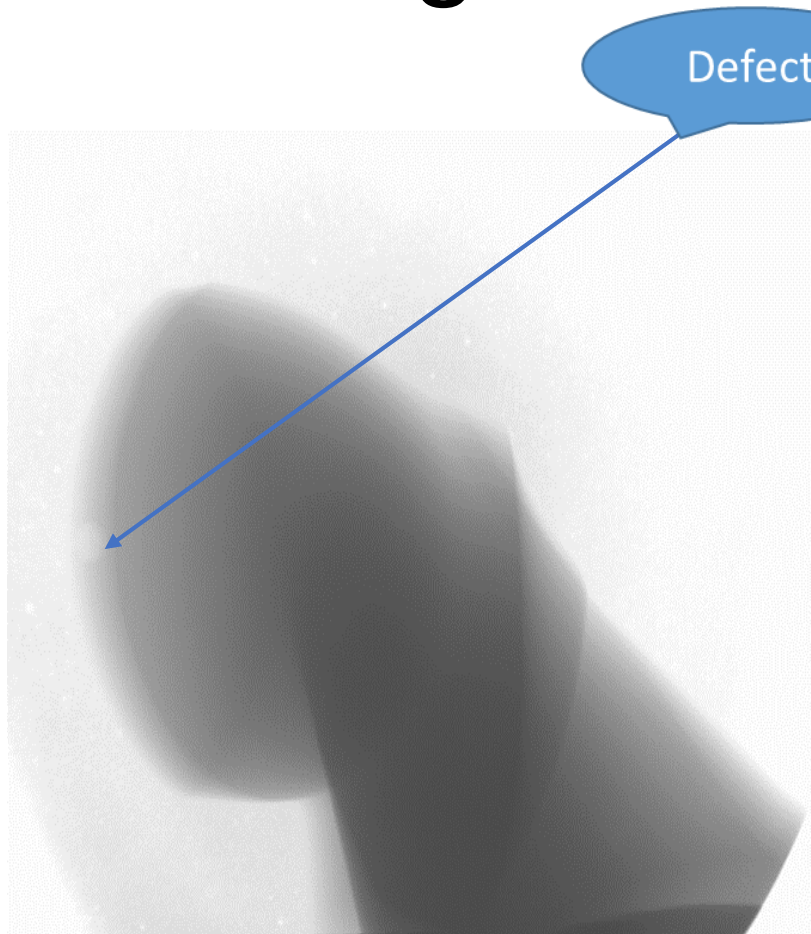


Figure3: Digital image of landing gear at 140 kV.

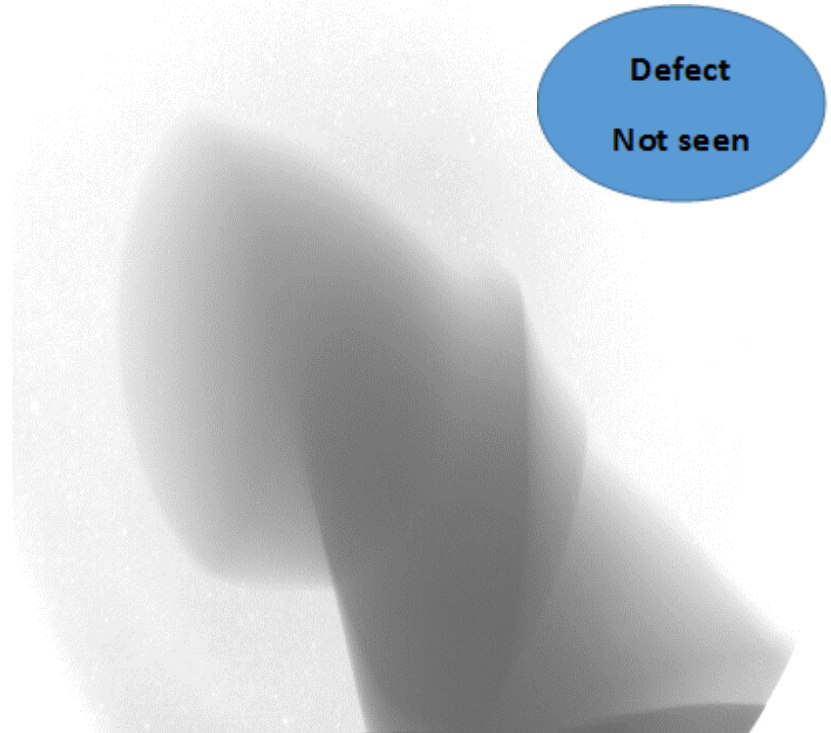


Figure4: Digital image of landing gear at 160 kV.



Results and discussion. Continues...

- at 120 kV, the defect characterization was clearer.
- They also display that the defect image has enlarged from the actual size of 2mm to 4mm.
- The main challenge in conducting radiographic testing using the digital methods was the geometry complexity on the area of interest of the component.



5. Conclusion

- intrinsic image quality observable at 120kVp and 300 μ A
- The geometric factors that contribute to discontinuity being hidden may be accomplished by rotating the component 15° angle per evaluation and interpretation.
- Digital radiography is recommended to be effective on evaluation of less dense material since minute indications are detectable. (*Condition: specialised technique is used*) .



Continues...

- The influence of this paper to the development of digital radiographic testing procedures for industries such as aerospace, automotive and manufacturing sectors is considered.



References

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- [3] harrmann T.R; Fauber T.L; Gill J; Hoffman C; Orth D.K, Peterson P.A; Prouty R.R; Woodward A.P and Odle T.G; (2012:2-9): best practice in digital radiography(white paper),
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Thank
you



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