

EMPLOYEES' TASK LOAD AND INCOME: ASSOCIATIONS WITH SAFETY EVENTS ATTRIBUTED TO HUMAN ERROR

Dr Nektarios Karanikas, CEng, PMP, GradIOSH, MRAeS, MIET, Lt. Col. (ret.)
Associate Professor of Safety & Human Factors

Aviation Academy

13th International Symposium
Australian Aviation Psychology Association (AAvPA)
7-9 November 2018, Coogee Beach, Sydney

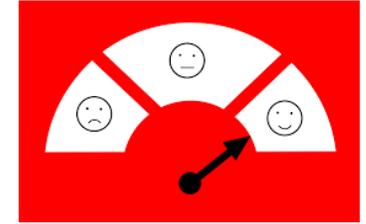
Karanikas, N. (2015). Correlation of Changes in the Employment Costs and Average Task Load with Rates of Accidents Attributed to Human Error, Aviation Psychology and Applied Human Factors, 5(2), pp. 104-113. DOI: 10.1027/2192-0923/a000083





JOB SATISFACTION & HUMAN ERROR

- Long-established motivational theories (indirectly) include job payment and working conditions as crucial factors:
 - Maslow (1954): when humans do not fulfil their basic needs, they might not consider safety as high priority
 - Herzberg et al (1959): decreased payment and inappropriate working conditions are dissatisfaction factors
- ICAO (2004, 2013) recognizes that:
 - management must, amongst several factors, consider the policies related to budget constraints since the latter are an error-provoking factor
 - organizations interact with the economic and political context, including factors such as national wealth, tax base, per capita income etc.
- Eksler et al (2010) concluded that the socioeconomic climate affected the rates of road accidents attributed to human error



PAYMENT AND JOB SATISFACTION

- Negative/marginal associations:
 - Broman et al. (2014); increases in salary were directly associated with decreases in satisfaction
 - Judge et al (2010): pay level marginally correlated with job satisfaction
- Positive associations:
 - Beutell & Wittig-Berman (1999) and Igalens & Roussel (1998): increased salary positively related to job satisfaction
 - Gerhart et al. (2004): pay as an important motivator
 - Denny et al (1980): individual payment incentives caused a 30% increase in production
 - Judiesch (1994): pay incentives increased productivity up to 44%
 - Guzzo et al (1985): payment level had the greatest effect on productivity
 - Gupta et al (1998): positive correlation between payment and productivity, but not between payment and product quality



RESEARCH MOTIVATION & OBJECTIVES

- Rasmussen (1997): economy, workload, and safety constitute the principal constraints of complex systems
- Brubaker & Probst (2001): the majority of the literature addresses safety-related factors linked to ergonomic conditions and organizational and individual characteristics
- There had not been sufficient research on the relationship between wage fluctuations and human error rates in conjunction with task load variances
- Data from an aviation organization to explore the association between rates of accidents attributed to human error and fluctuations of employment expenditures and task load



SAMPLE & VARIABLES

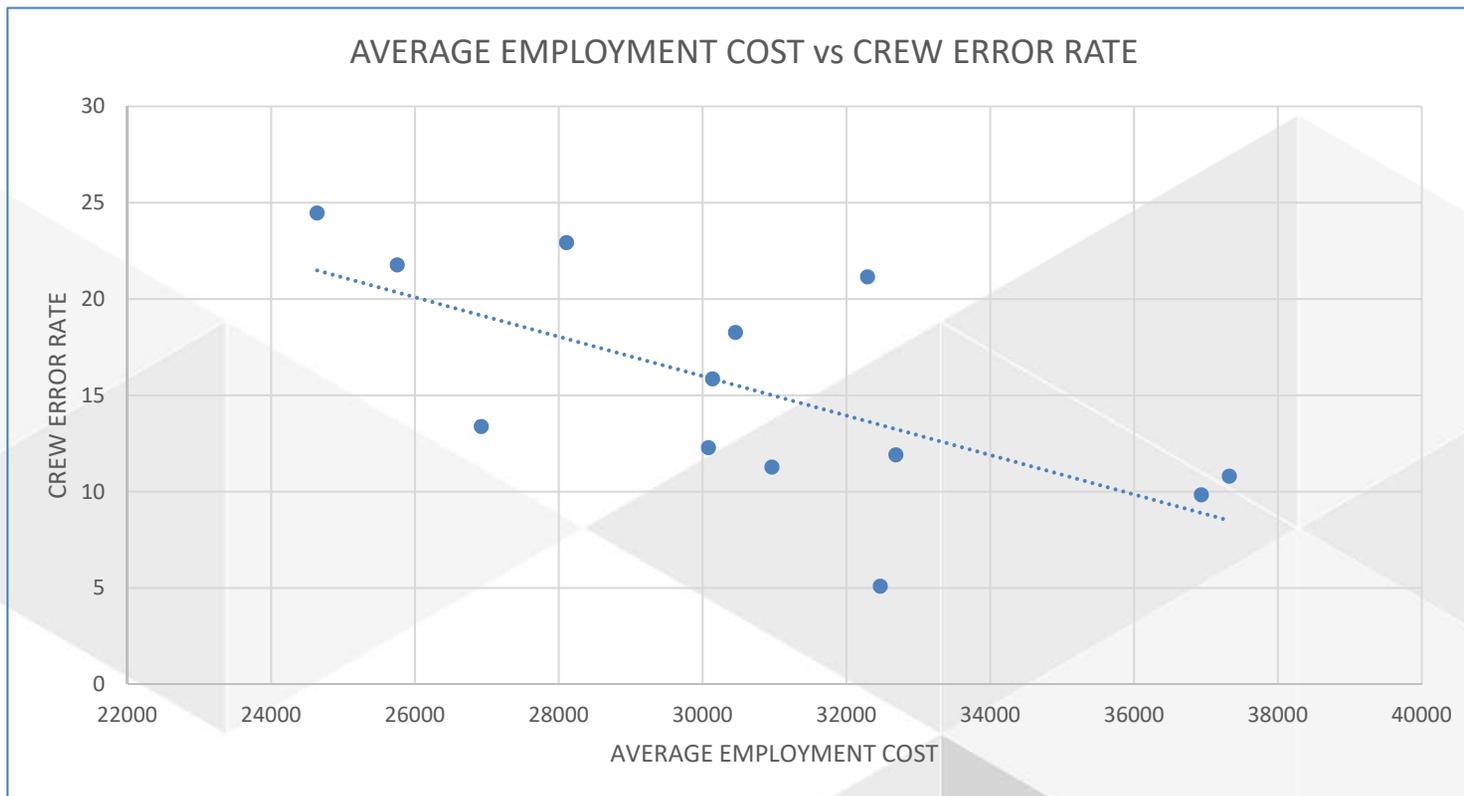
- Large aviation organization: flight activity, financial, and accident records from a period of 13 years.
- Financial:
 - Employment budget: covers wages, salaries, compensations, and allowances
 - Data of the entire employee population for each year of study: calculation of the average per capita cost
- Safety occurrences:
 - All human error-related events, regardless of their classification as major or minor
 - Events related to activities on aircraft
 - Human error cases: end-users (pilots & engineers/technicians) and supervisors
- Variables
 - Exogenous: per capita cost & average task load
 - Endogenous: rates of events attributed to human error



ASSUMPTIONS/APPROXIMATIONS

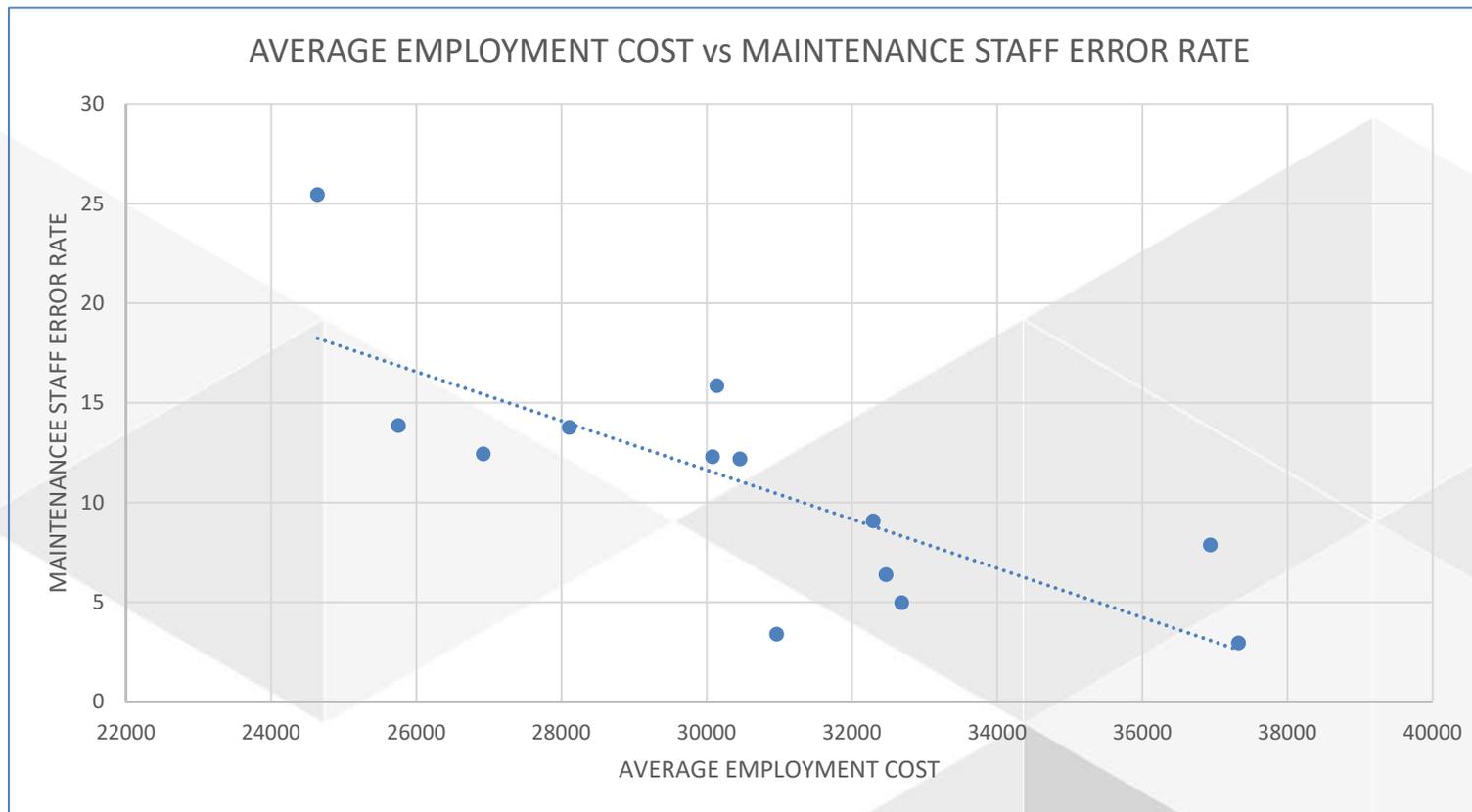
- Any fluctuation of employment costs:
 - affected proportionally all professional groups of the organization
 - followed the same escalating or declining patterns for all staff annually
- The flying activity of the aviation organization:
 - steered proportionally the task load of all supporting activities
 - served as a valid estimator of the overall task load variance
- The annual staff turnover has been less than 2% -> the employee population over time was considered homogeneous
- Apart from the task load, other factors (i.e., peer pressure, environmental conditions, and mental workload) remained almost constant for each year of reference
- Inflation rates not considered due to inability to adjust respectively accident rates

SPEARMAN'S CORRELATIONS: PER CAPITA COST (PILOTS)



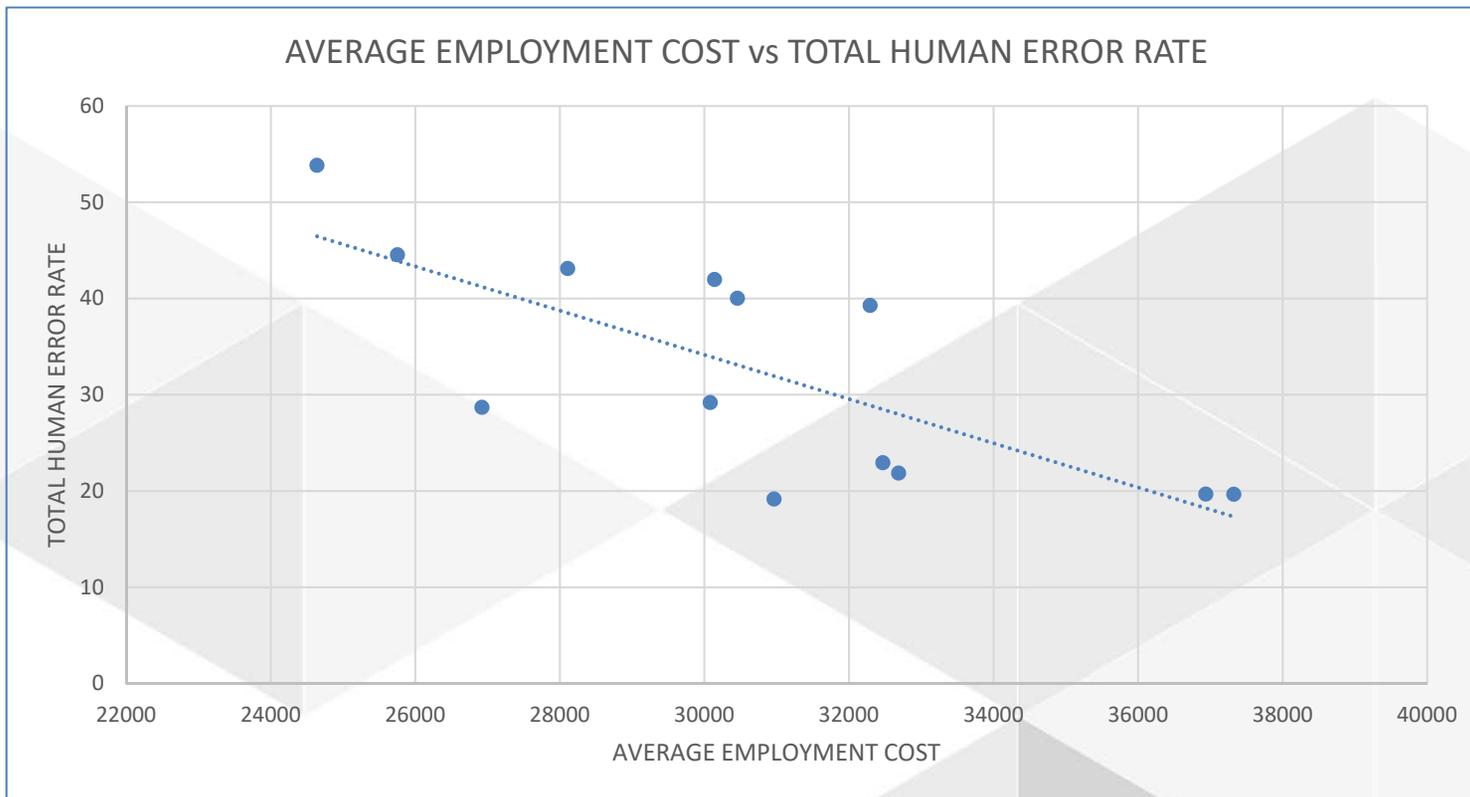
($\rho = -0.780$, $p = 0.002$)

SPEARMAN'S CORRELATIONS: PER CAPITA COST (MAINTENANCE)



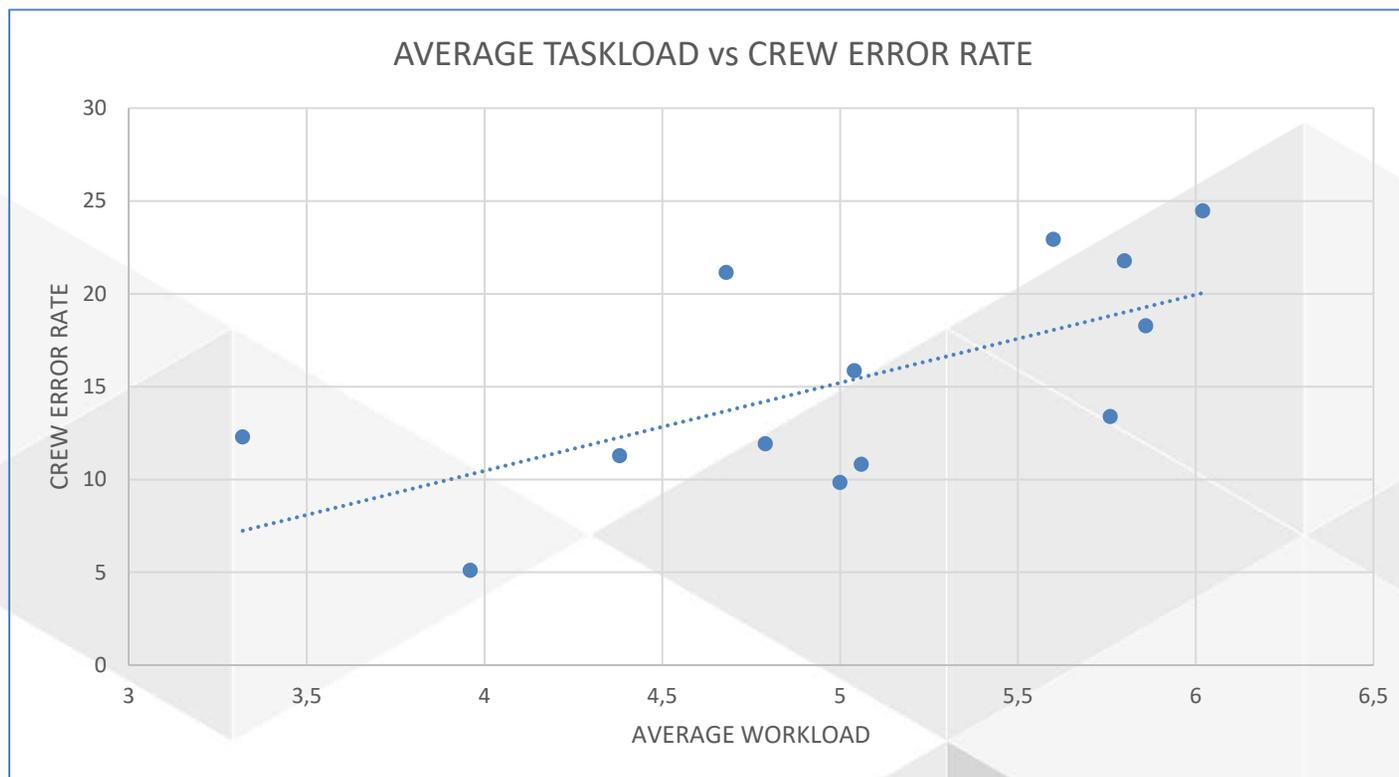
($\rho = -0.868$, $p = 0.000$)

SPEARMAN'S CORRELATIONS: PER CAPITA COST (ALL ROLES/FUNCTIONS)



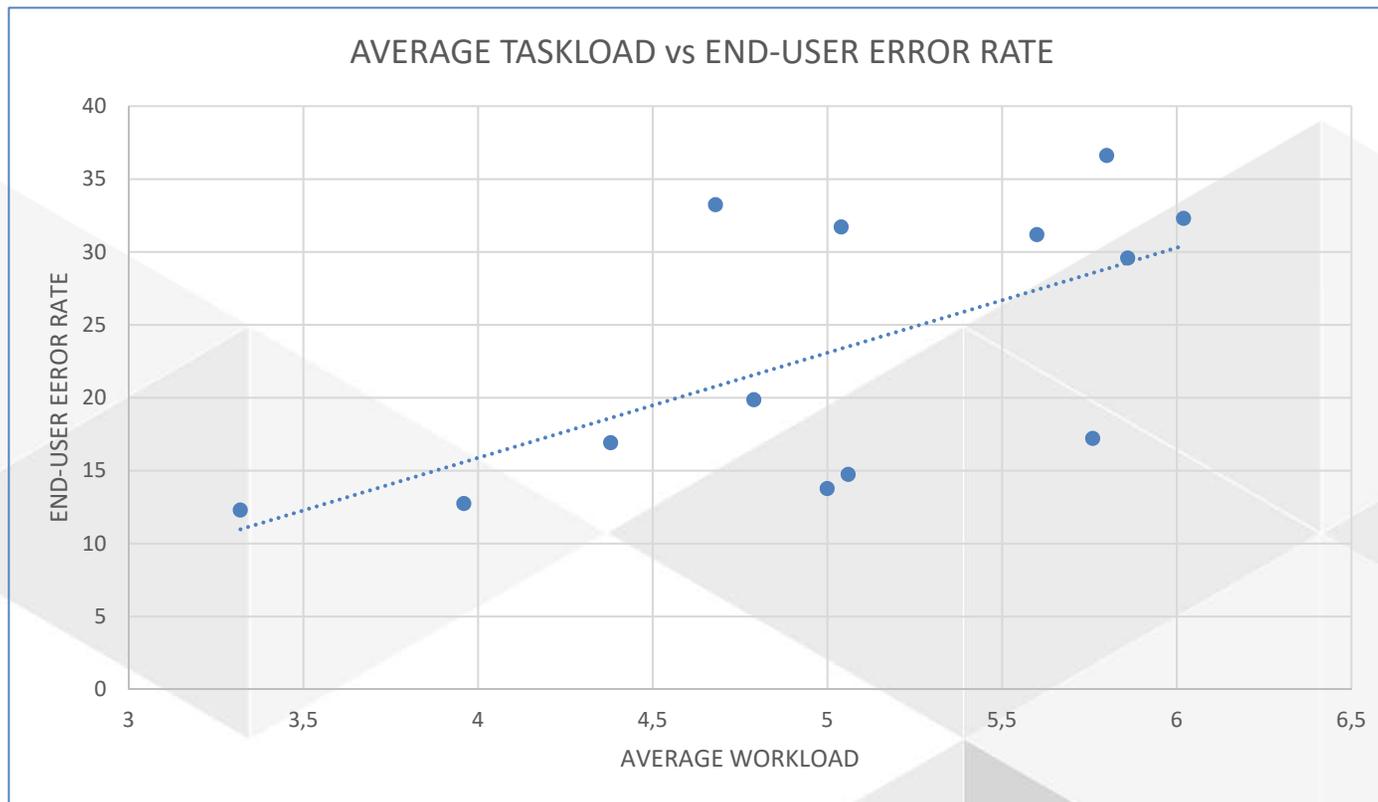
($\rho = -0.791$, $p = 0.001$)

SPEARMAN'S CORRELATIONS: TASK LOAD (PILOTS)



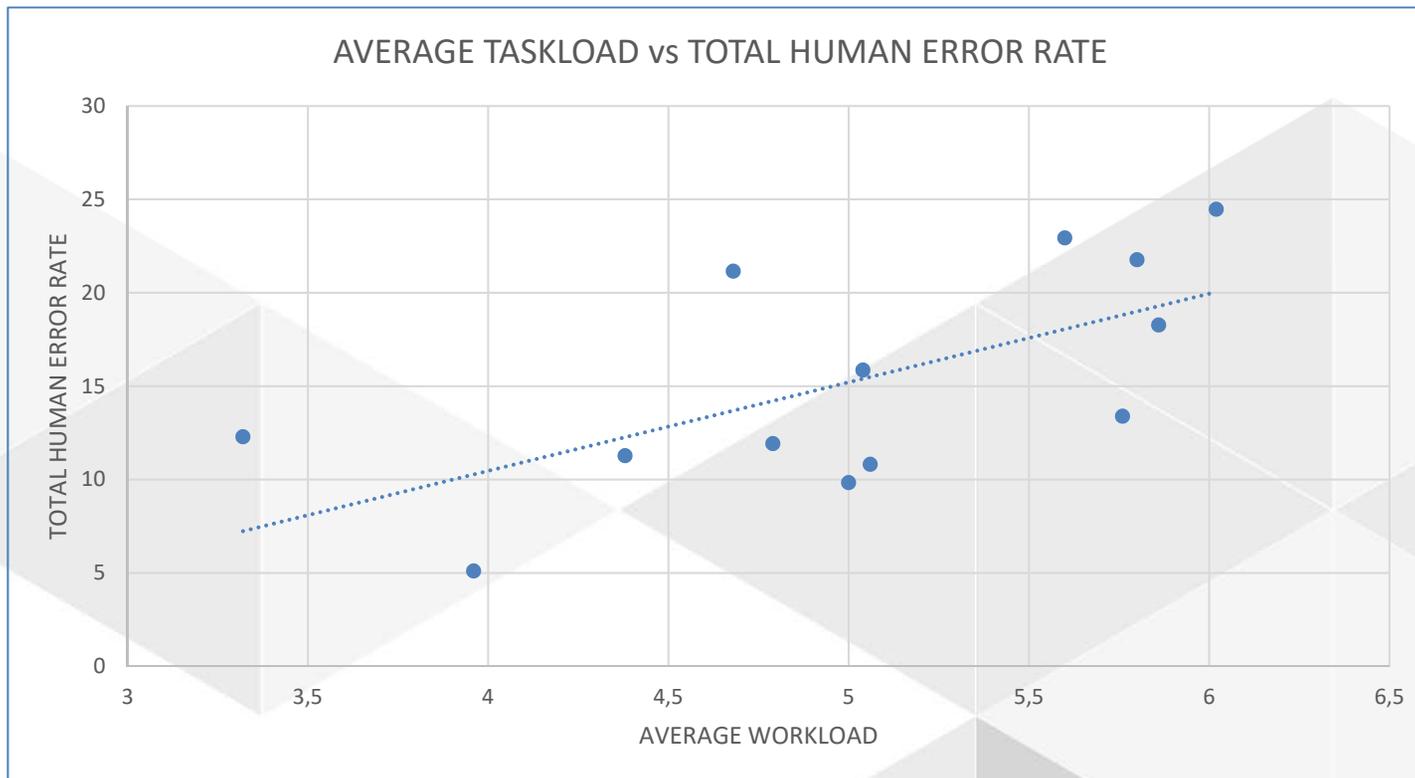
($\rho = 0.637$, $p = 0.019$)

SPEARMAN'S CORRELATIONS: TASK LOAD (END-USERS)



($\rho = 0.599$, $p = 0.031$)

SPEARMAN'S CORRELATIONS: TASK LOAD (ALL JOBS/FUNCTIONS)



($\rho = 0.588$, $p = 0.035$)



OTHER RESULTS

- When controlling for task load -> the lower the average expenditure per employee, the higher the rate of events attributed to:
 - flight crew error ($\rho = -0.684$, $p = 0.007$)
 - maintenance staff error ($\rho = -0.817$, $p = 0.001$)
 - human error when considering all job functions and roles ($\rho = -0.704$, $p = 0.005$)



INTERESTING OBSERVATIONS

- When the per capita cost was controlled, no significant associations were observed between average task load and event rates attributed to human errors
- The event rates attributed to flight crew errors were associated with both independent variables
- Task load did not affect significantly the rates of events attributed to maintenance personnel:
 - low variance of task load?
 - compensation of high task load by other means?
- No associations for supervisors -> end-users more vulnerable to fluctuations of employment costs and task load?



FINAL REMARKS

- Higher task load (short-term effects perceived) seems easier managed than lower income (long-term effects perceived).
- Employment costs and task load are not the only factors influencing directly or indirectly human performance
- Organizations that encounter financial problems and proceed to budget reductions to ensure their sustainability might consider countermeasures such as:
 - Recognition
 - Advancement
 - Transparency
 - Meritocracy
- A balanced management of factors influencing emotional, psychological and physiological states is recommended. Fixing some factors and neglecting others will rather not be effective.

EMPLOYEES' TASK LOAD AND INCOME: ASSOCIATIONS WITH SAFETY EVENTS ATTRIBUTED TO HUMAN ERROR

Dr. Nektarios Karanikas, CEng, PMP, GradIOSH, MRAeS, MIET, Lt. Col. (ret.)
Associate Professor of Safety & Human Factors

Aviation Academy

Thanks!

13th International Symposium
Australian Aviation Psychology Association (AAvPA)
7-9 November 2018, Coogee Beach, Sydney

CREATING TOMORROW

Contact: nektkar@gmail.com, n.Karanikas@hva.nl

