

Berkay Kuşkırı

Aerospace Structural Analyst · Metallic & Composite Aircraft Structures

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9+

YEARS IN AEROSPACE
STRESS

4

AIRCRAFT
PROGRAMMES

10

PROJECTS & METHOD
STUDIES

M.Sc.

SOLID MECHANICS · ITU

PROFILE

Lead Structural Analysis Engineer at Turkish Aerospace Industries (TAI), working on metallic and composite aircraft primary structure since 2017 (9+ years). The work covers the whole stress discipline: static strength and stability, fatigue and damage tolerance, composite and lightweight design, GFEM-based sizing and structural optimisation. Currently leads the durability and damage tolerance (DaDT) work package on a fighter-jet programme and, since late 2025, analysis method and tool development in the stress group. Earlier work covers EASA CS-23 certification stress analysis on the Hürkuş trainer (forward fuselage, and the rudder weight-reduction study), GFEM-based sizing of fighter primary structure, and preliminary landing-gear and eVTOL structural studies. Day to day that means stress reports taken through release, sizing and weight trade studies, crack-growth and fail-safe assessments, and non-conformance dispositions agreed with the loads, design and test teams.

Core competencies: Static strength & stability · Fatigue & damage tolerance · Composite & lightweight design · GFEM sizing & sub-modelling · Joints & detail substantiation · FE-test correlation · Structural optimisation · Python analysis tooling

EXPERIENCE

Method & Tool Development Engineer

Oct 2025 — Present · concurrent

Turkish Aerospace Industries (TAI) · Ankara, Turkey

- Develop internal tools that automate repetitive stress-analysis work for the stress group.
- Build surrogate models of expensive FE evaluations for rapid sizing trades and design-space exploration.
- Write automated FE post-processing pipelines (pyNastran, Abaqus and Femap scripting) that turn raw results into margin-of-safety tables and report figures.
- Standardise hand-calc workbooks and stress-report templates for reuse across programmes, with version control and input/output checks.
- Work with analysts and IT to turn recurring analysis problems into tools that are actually deployed and maintained.

Fatigue & Damage Tolerance Engineer

Aug 2021 — Present

Turkish Aerospace Industries (TAI) · Ankara, Turkey

- Lead the Durability & Damage Tolerance (DaDT) work package on primary metallic and composite airframe structure of a next-generation fighter platform.
- Own the DaDT analysis chain: GFEM internal-load extraction, detailed sub-models, fatigue spectrum application, crack-growth assessment and inspection-interval setting.
- Write and release DaDT stress reports for fracture-critical and durability-critical parts under formal revision control and design-office sign-off.
- Substantiate joints, cut-outs, fillets, fastener load transfer and other stress concentrations with detailed FE models and classical hand calculations.
- Derive DaDT allowables for multiple material and configuration cases and feed them into the GFEM-based global sizing loop.
- Run primary-structure trade studies on stock size, alloy selection and section topology against weight and DaDT targets.
- Drive design changes that retire fatigue hot-spots without breaking the mass budget.
- Disposition structural non-conformances on produced parts: repair schemes, life-impact assessments and concessions.
- Mentor junior stress engineers on hand-calc and FE workflow, fatigue methodology and report standards.

Structural Analysis Engineer

Sep 2017 — Aug 2021

Turkish Aerospace Industries (TAI) · Istanbul, Turkey

- Hürkuş trainer: substantiated metallic and composite primary structure on the Hürkuş-B forward fuselage and Hürkuş-C rudder against EASA CS-23 requirements.

- Hürkuş-B: wrote the forward-fuselage certification stress report and closed authority and internal review comments through release.
- Hürkuş-C: led the rudder weight-reduction study (composite lay-up resizing and hinge re-design) while keeping reserve-factor compliance.
- eVTOL cargo concept: conceptual structural sizing (load-path layout, primary-mass estimation, material down-selection) for a military cargo platform.
- Re-engineered structural attachments and routing supports for hydraulic and fuel-system upgrades without invalidating the original type-design substantiation.
- Landing gear: built the first analysis-grade landing-gear FE model and sized strut and trunnion fittings against drop and braking load cases.
- Correlated FE results with coupon and element-level test data and resolved analysis-vs-test discrepancies inside the certification report chain.

Project Student & Intern

Jul 2016 — Jun 2017

TEI — TUSAŞ Engine Industries · Eskişehir, Turkey

- B.Sc. thesis research on a gas-turbine curvic coupling: parametric FE study of tooth-flank stress and contact pressure under various load cases.
- Summer internship (2016) with the engine stress and design teams.

AIRCRAFT PROGRAMMES

Fighter Jet — Method & Tool Development

2025 — Present

Turning the Durability & Damage Tolerance methodology of the fighter-jet programme into validated, automated engineering tools, so that methods analysts run by hand become repeatable software.

Python · pyNastran · Surrogate Models · DaDT Methods · Automation

Fighter Jet — Durability & Damage Tolerance

2021 — Present

DaDT substantiation of primary metallic and composite airframe structure on a next-generation fighter.

DaDT · GFEM · MSC Nastran · Slow Crack Growth · Composites

Hürkuş Trainer — Certification Stress Analysis

2018 — 2019

Static, fatigue and stability substantiation of metallic and composite structures on the EASA CS-23 Hürkuş trainer.

EASA CS-23 · MSC Nastran · Patran · Composites · Certification

Landing Gear — Preliminary Stress Sizing

2017 — 2018

Preliminary FE model and initial stress sizing of a landing-gear assembly during pre-PDR layout.

Landing Gear · MSC Nastran · Hand Calcs · Preliminary Sizing

e-VTOL — Conceptual Structural Sizing

2019 — 2020

Conceptual structural sizing of an e-VTOL military cargo platform: load-path layout, primary-mass estimation and material down-selection feeding the platform feasibility gate.

e-VTOL · Conceptual Design · Trade Studies

RESEARCH & METHOD STUDIES

M.Sc. Thesis — Composite Rim Optimisation (MOGA-II)

2018 — 2022

M.Sc. thesis at Istanbul Technical University (2022). Lightweight design of a 19-inch, 8.5-inch-wide ten-spoke automotive rim in plain-weave CFRP prepreg. The MOGA-II genetic algorithm optimises ply orientation and ply count to minimise mass and deformation while keeping the rim structurally sound under radial, cornering and torsion load cases.

MOGA-II · CFRP · Composite Optimisation · MSC Nastran · HyperMesh · Lightweight Design

Topology Optimisation of an Aircraft Bracket

2021

Density-based topology optimisation of a metallic bracket with manufacturing constraints, followed by detail re-meshing and non-linear FE re-validation. Used as a methodology demonstrator for mass-down studies on secondary structure.

Topology Optimisation · Abaqus · Non-linear FEA

Non-linear FEA of Bolted Joints

2020

Contact-based non-linear FE study on load transfer through metallic bolted joints. Compares bearing-bypass distribution against classical hand-calc methods and lookup data.

Abaqus · Contact · Bolted Joints · Hand Calcs

Composite Plate Buckling Study

2019

Linear eigenvalue and non-linear post-buckling analyses of stiffened composite panels across lay-ups and boundary conditions, used to calibrate hand-calc panel-buckling workbooks.

Composites · Buckling · Stiffened Panels

B.Sc. Thesis — Curvic Coupling Parameter Study

2017

Parametric FE study on the behaviour of a gas-turbine-engine curvic coupling under various loads. Mapped tooth-flank stress and contact pressure across geometry parameters to inform design selection.

Gas Turbine · Curvic Coupling · Contact · FEA

EDUCATION

M.Sc. in Solid Mechanics

Feb 2018 — Jul 2022

Istanbul Technical University · Istanbul, Turkey · GPA 3.69 / 4.00

Thesis: *Optimization of CFRP Prepreg Composite Rim by Using MOGA-II Genetic Algorithm* · open access: hdl.handle.net/11527/25166

Coursework: Finite Element Analysis in Engineering · Theory of Elasticity · Foundations of Solid Mechanics · Failure Analysis · Fatigue of Materials and Structures · Engineering Mathematics · Advanced Topics in Materials Handling · Introduction to Computer Aided Engineering

B.Sc. in Mechanical Engineering — Specialty: Structure

2012 — 2017

Yıldız Technical University · Istanbul, Turkey · GPA 3.55 / 4.00

Thesis: *Behavior of a Gas Turbine Engine Curvic Coupling Parameters Under Various Loads* · TEI undergraduate research

Erasmus+ Exchange — Mechanical Engineering

2015 — 2016

Brno University of Technology · Brno, Czech Republic

SKILLS

Analysis & Substantiation

Static, Stability & Buckling Analysis · Composite Strength & Stability · GFEM Load Extraction & Sub-modelling · Durability & Damage Tolerance (DaDT) · Slow Crack Growth & Fail-Safe Analysis · Fatigue Spectrum Application · Bolted-Joint & Lug Analysis (Hand Calcs) · Non-conformance Disposition & Repair Schemes

FEA Solvers & Pre/Post Standards & Compliance

MSC Nastran · Abaqus · ANSYS Mechanical · MSC Patran · Altair HyperMesh · CATIA V5
EASA CS-23 / FAR Part 23 awareness · CS-25 / FAR 25.571 awareness · Test-analysis correlation

Programming & Automation

Python scientific stack (NumPy, SciPy, pandas, Matplotlib) · pyNastran (Nastran deck and result parsing) · Abaqus Python scripting · Femap API / PCL (Patran Command Language) · HyperMesh Tcl/Tk scripting · Nastran DMAP & bulk-data automation · Git version control · MATLAB · Excel / VBA hand-calc workbooks

Lightweight Design & Optimisation

Composite lay-up and ply-count optimisation · Topology optimisation with manufacturing constraints · Weight-reduction trade studies (stock, alloy, section topology) · Conceptual sizing and primary-mass estimation · Multi-objective optimisation (MOGA-II, NSGA-II, pymoo) · Surrogate models for FE acceleration · Design of Experiments (DoE) & response surfaces · scikit-learn (regression and life-prediction models)

Engineering Leadership

DaDT work package lead (planning and review) · Mentoring of junior stress engineers · Stress-report authoring & release control · Design-review representation (PDR / CDR) · Cross-team coordination with Loads, Design, Test and Manufacturing

LANGUAGES & INTERESTS

Turkish — Native · **English** — Professional working proficiency (C1)

Interests — Music · Theatre acting · Board games