

# Preface

In design projects at all levels, bottlenecks are reached often. Conventional resources in hand to move ahead are brainstorming, trial and error, consultation with a senior; all these techniques often lead to a compromise solution. In TRIZ terms, these are inventions, but of lower levels. In contrast, TRIZ is ever itching to notice contradictions everywhere: administrative, technical, and physical. First type, viz. administrative appear in TRIZ application to social, political, or economic systems. It is technical contradiction, called TC and physical contradiction, called PC that is of particular interest to TRIZ for engineers, technologists, and scientists. They are worth exemplifying. If wings of plane are broadened, lift increases but drag increases too. If wings of plane are narrowed, lift decreases but drag decreases too. In this case, ‘width of wing’ is a physical characteristic (one of important dimensions) of airplane, while lift and drag are system properties (actually forces in aerodynamics). If we frame this challenge without ‘width of wing’, we get this: if lift improves i.e. increases, drag worsens, i.e. increases; if lift degrades i.e. decreases, drag improves i.e. decreases. Little need to mention, that lift is a desired property while drag is an undesired one—reduction of latter is effectually betterment. We call this TC. In TC, improvement of one system property inevitably leads to worsening of another system property. The same challenge could have been stated in terms of wing span alone: wings of plane must possess large area and small area together. We call this PC, wherein one physical characteristic like mass, size, length, temperature must have ‘dual’ values simultaneously. Readers must be curious to know how TRIZ proceeded in this aeroplane case. Shorting the process of TRIZ application, TRIZ works like this: instead of shying away from contradictions, TRIZ strengthens them. Then it applies its tools like Altshuller’s matrix followed by inventive principles, principles of PC resolution like separation in time or space, laws of technical systems’ evolution, ARIZ, etc. The laws of technical systems’ evolution are one of strongest and universal techniques of TRIZ. Aim of entire TRIZ treatment is to reach a witty so-called convoluted technical solution. The technical system is leaned, stripped of useless weight yet made more capable of performing function it is supposed to. This simultaneous enhancement of useful effects with shrinking or envisioned

vanishing of harmful effects, called convolution is so admirable that we call it idealization. This book studies this phenomenon, its natural occurrence in evolutionary graph of systems and most importantly methods to pre-pone it and to apply it to particular systems of interest with special focus on set of system variables. These methods fall under ‘trimming’—a highly commercial term finding prime place in business plans of innovative design of factory processes, product manufacturers, and industrial corporations. Before closing, solution to airplane lift dilemma: foldable wings were invented by man: separation on condition has occurred. During take-off and landing when lift is supreme and necessary under low speeds, flaps are opened. During cruise when high speeds can easily provide lift and drag becomes a strong evil, they are closed.

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Trimming, Miniaturization and Ideality via Convolution  
Technique of TRIZ

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