

# Aerodynamics, Mathematics and Pro Life: What's the Connection?

By Stephen J Koob, PhD

## Author

Steve Koob has a BS in Aeronautical Engineering from Parks College of St Louis U, an MS in Aeronautical Engineering from Rensselaer Polytechnic Institute, and PhD from Purdue U in Fluid Mechanics. During his 20 years active duty with the USAF, he was engaged in research and development at the Flight Dynamics Laboratory, and teaching/research at the Air Force Institute of Technology. His prolife work began with Clark County RTL in the late 70s and continued with Dayton RTL, Ohio RTL, Elizabeth's New Life Center, numerous "Life Academies", American Family Assn, and for the past 10 years as the Director and Co-Founder (with Mary Ann Walsh) of One More Soul, an apostolate committed to helping people understand the blessings of children, the harm of contraception/sterilization, and the benefits of natural family planning.

## Abstract

Based on about a quarter century of experience in aerodynamics and applied mathematics, and a similar period promoting life, the author finds common ground between what appear to be disparate disciplines. The insights and analogies presented can guide our life and our pro-life efforts and hopefully accelerate the time when our culture can truly be labeled a "Culture of Life" — "A Civilization of Love".

## Introduction

For 28 years from 1957 to 1985, I studied or worked in the aeronautical engineering field, 20 of those years in the USAF, virtually all of it at Wright-Patterson AFB, Dayton, Ohio. I did research and managed research, and taught and did research on the faculty at the Air Force Institute of Technology for nine years. From 1977 until the present, I have been involved with pro-life work, about the same length of time that I was an aeronautical engineer. In recent years it has struck me that some of my experiences as an engineer and applied mathematician has undergirded my pro-life efforts — probably more subconsciously than consciously. This presentation is an effort to demonstrate connections, analogies, and lessons that can be taken from the fields of aerodynamics and mathematics to the pro-life movement.

I'm sorry that for some of you, who are not familiar with certain mathematical concepts, parts of this presentation may be incomprehensible. I hope that most of you will find something here that is either interesting, challenging, and/or entertaining.

I probably should have included another discipline along with aerodynamics and mathematics— Theology—the study of God. Why study God, you may ask? Well, because God knows everything—He has all the answers—about aerodynamics, mathematics, life and everything else, including love, sacrifice, logic, faith, reason, etc. We get our clearest picture of God in Jesus Christ, the God-Man, the carpenter's son, who according to Mel Gibson, designed and built the first waist-high dining table. Jesus was probably a very good carpenter. God the creator/designer/builder of the universe is undoubtedly the ONE that all professionals could learn from, whether one strives to be a healer in the medical profession, preacher in the church, a lawyer, building contractor, teacher, or really anything. Wasn't God the best at whatever good there is or could be?

Mathematicians state "Theorems" and so I'll now state my first Theorem for the day.

Theorem #1: No matter what your field of study, you can learn more from studying God's contribution to that field than the contributions of all the other experts in that field.

Father Frank Pavone has said on many occasions that there are two important lessons we should each learn in life: First, there is a God, and second, I am not God. Both of these facts should be self-evident and accepted. But it is also true that each of us has been made in the image and likeness of God — made in God's image and likeness — but not God.

## Mathematics

That thought gives us our first opportunity to use a mathematical concept — the idea of infinity for which we use the symbol of a tired numeral 8 —  $\infty$ . Mathematically, we define  $\infty$  to be “undefined.” It is a quantity that grows without bound. An example of this concept of infinity can be found in the function  $f(x)=1/x$ . Figure 1. illustrates this function.

@  $x \rightarrow \pm 0, f(x) \rightarrow \pm \infty$

or,  $\lim_{x \rightarrow \pm 0} f(x) = \pm \infty$

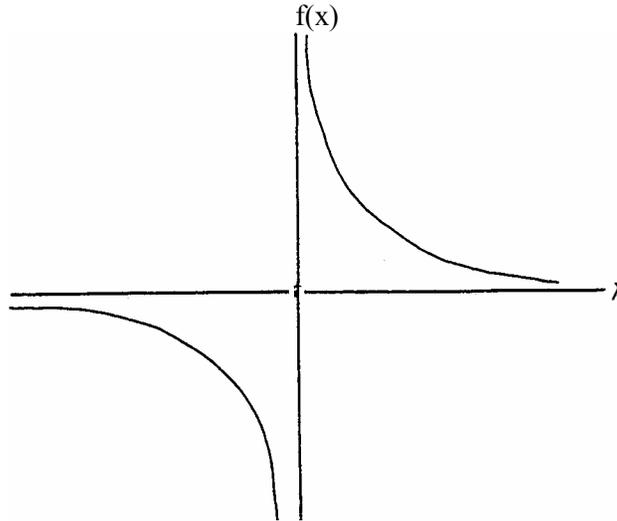


Figure 1.  $f(x)=1/x$

At the point  $x=0$ ,  $f(x)$  is undefined and we refer to the point  $x=0$  as a “singular point” or “singularity” — that is a point where the function is “undefined” or “incomprehensible”.

A mathematician would say that God is “doubly-infinite”, or just plain “infinite”, because God has no beginning or end. He always existed and always will.

On the other hand, we humans are “semi-infinite” because we have a beginning — conception — but we have no end. We will BE for all time, once we have BEgun. If you had not been conceived, you would not BEdin, or BE, or exist. So if we draw a time-line as in figure 2, we can see the singularities and discontinuities of what I’ll call an Existence Function,  $E(t)$ , where  $t$  is time.

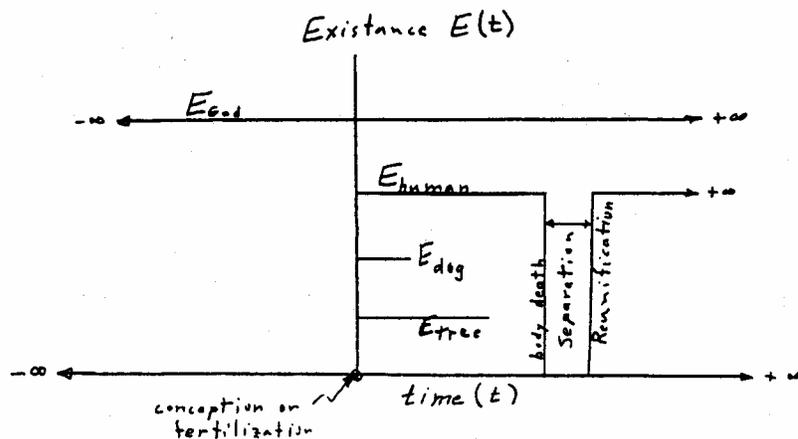


Figure 2. Existence Function  $E(t)$

From the perspective of eternity, in a sense from God’s perspective, it isn’t very important how long we live, that is, how long our bodies live. Of far greater importance is the fact that our soul will exist forever. In the language of mathematics, we can say that God’s “existence” is represented by a continuous function  $E_{\text{God}} = \text{constant}$ . He is constantly there and available to us when we need or want Him. On the other hand,  $E_{\text{human}} = \text{discontinuous function with three discontinuities, at conception, death (of the body), and final Koob} - 2004$

reunification of soul to a glorified body. These discontinuities appear to be singularities where the human existence is undefined or unexplainable. These are points of mystery eliciting questions like, When does life begin? When does ensoulment take place? Dr Jack Willke, MD, would say, “When the sperm and ovum complete their joining”. But what precisely does ‘joining’ mean? Human cloning without sperm may force us to a new definition of life’s beginning. I think it is a true statement that the Roman Catholic Church has not yet defined when ensoulment occurs.

What is the exact moment of death? When does the soul leave the body? When can organs be harvested? When there is no brain stem activity, or when our instruments are not sensitive enough to detect the activity that may still be there.

And when and to what will our bodies be transfigured? What age will we be? Will we have a procreative system or an excretory system? I once asked a priest why he thought God made these two functions (procreative and excretory) essentially coexistent/congruent in our bodies. His answer was: “God has a sense of humor.” But, I don’t think God is frivolous or a jokester. I think of God as the perfect designer/creator/builder and that He has optimized the design of our bodies to meet His purposes. It is my understanding that we will have no need for our excretory or procreative function in heaven, so having them congruent simplifies the transformation to a glorified body.

It is our challenge here on earth to determine God’s plans for our bodies and our lives and then follow His plan. When we get that figured out we will be very happy, here on earth as well as in heaven. That is what God suggested in the ‘Our Father’ where He told us to pray “Thy kingdom come, thy will be done, on earth as it is in heaven.”

I claim that, from an eternal perspective, the time between conception and bodily death is not very important. Mathematicians often use the Greek letter epsilon ( $\epsilon$ ) to refer to a “small quantity”. Whether one ‘lives’ for only a few hours, minutes, or seconds after conception or for 100 years, that time is always an  $\epsilon$  compared to eternity/infinity ( $\infty$ ). In other words, once you are conceived — your soul is created — you are IN. You are going to BE forever and ever, and ever, and ever, etc.

What does this all mean for the pro-life movement? I propose the following Theorem and three corollaries.

- Theorem #2      Conception/fertilization/ensoulment is the most awesome moment of our lives because once we BEgin/exist, we have a soul that will exist forever in the presence of God, family, saints, and angels.
- Corollary A      Denying God His plan for the beginning of a new human life denies that potential life eternal existence. True contraception is thus far more serious than murder, infanticide and abortion.
- Corollary B      Cooperating with God’s plan for life, being open to new life in the marriage act, and procreating with God a new human life is a couple’s most awesome accomplishment.
- Corollary C      God’s accepting of a human nature in the person of Jesus Christ is the most awesome event in all of human history. His human personhood, BEgun at conception in Mary, makes us brothers and sisters of God. That is why the Annunciation of the Lord (and His simultaneous Incarnation, I believe) is of utmost significance to every one, but especially for those who promote life.

In the movie “The African Queen”, Katherine Hepburn’s character states: “Nature is what we were put in this world to rise above.” It is God’s becoming one of us that gives us the potential, and challenge, to rise above our human nature.

Whenever God and man and woman procreate a new human life there is a singularity in the human life function because a new life begins — a life that never existed before — a life that will never end. The beginning of a new life is similar to the “Big Bang” that started the universe — both started something from nothing — but the creation of each new life is much more awesome than the Big Bang. Based on worldwide birth rates, I estimate that God is creating an average of about 10 souls/second. Only 5 to 6 of those result

in birth; the remaining are just a really rough guess at those lives that end before birth due to abortion and miscarriage

There is more that one could say along this thread, but it is time to move in another direction.

### Aerodynamics

The mathematical concepts of discontinuity and singularity that we have been focusing on have application in the study of aerodynamics (and/or fluid mechanics). Aerodynamics can be defined as study of the flow of air (or other fluid) over a body, like an airplane, automobile, or man on a bicycle.

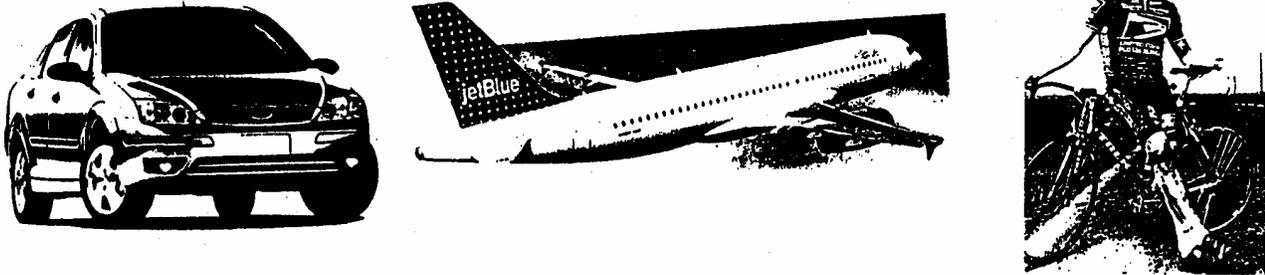


Figure 3. Aerofluidmechanic Examples

The mathematical models that represent the physical flow of fluids over a body are a set of equations called the “Navier-Stokes Equations”. These equations guarantee that the fluid in motion satisfies certain physical laws or principles.

- 1. Conservation of Mass → Continuity Eqn

$$V=(u,v) \quad \nabla \cdot V=0 \quad \frac{\delta u}{\delta x} + \frac{\delta v}{\delta y} = 0$$

- 2. Newton’s Second Law → Eqn of Motion

$$\int (\nabla \cdot \nabla)V = -\nabla p + \mu \nabla^2 V$$

$$\int (u \delta u / \delta x + v \delta u / \delta y) = -\delta p / \delta x + \mu (\delta^2 u / \delta x^2 + \delta^2 u / \delta y^2)$$

$$\int (u \delta v / \delta x + v \delta v / \delta y) = -\delta p / \delta y + \mu (\delta^2 v / \delta x^2 + \delta^2 v / \delta y^2)$$

- 3. Conservation of Energy → Energy Eqn

- 4. Condition of the Fluid → Energy Eqn

$$\rho = \int R T$$

Figure 4. Navier-Stokes Equation

Certain “boundary conditions” accompany these equations and are required for a unique solution that has physical meaning:

1. Far from the body, the flow field is undisturbed by the body placed in it.

$$V=V_{\infty} \text{ at } x \rightarrow -\infty, y \rightarrow \pm\infty$$

2. The surface of the body is impervious to the fluid.

$$V \cdot \Pi|_{\text{body}} = 0$$

It is the non-linearity of the Navier-Stokes Equations that makes them so difficult to solve. In fact, there is no general solution to these equations and they are considered one of the seven most important unsolved problems in mathematical physics.

The conservation principles on which these equations are based are so well established that no mathematician, physicist, or engineer would dare present a paper or propose a research project for determining the flow over a body in violation of these principles. Any university professor who would teach aerodynamics contrary to these principles would be the laughing stock of the campus and would soon be fired.

Are there comparably immutable principles in the social sciences? There should be; let's propose a few.

- I. Life is a sacred gift from God, only to be taken back by God.
- II. Life begins at conception/fertilization.
- III. The primary purpose of sexual intercourse is the procreation of new human lives. The secondary purpose is to bond the husband and wife for the long-term sustenance of their children.
- IV. The most desirable environment for raising children is the family that results from the permanent loving marriage of one man to one woman.
- V. There is a God—a God who lives, loves and leads.
- VI. We are not God, even though we are made in God's image and likeness.
- VII. God is a rational being. His divine plan is rational and logical. Creation and nature are rational, logical and orderly. The technical sciences are solid witness to that order, logic and reason.

Figure 5. Social Science Principles

Sadly, the social sciences do not always respect these Principles. One need not point out to this audience the many violations to the Sanctity of Human Life Principle — abortion, euthanasia, infanticide, murder, war, capital punishment, terrorism, ethnic cleansing, genocide and assassination. The medical community is riddled with an incredible lack of integrity as they attempt to redefine common-usage terms like “pregnancy” and “conception” to exclude those few days between fertilization and the implantation of the embryo in the uterine lining. They seek to ignore this first week of life, when the human form experiences exponential growth and development, by trying to popularize “pre-embryo” terminology as if there was no one there until implantation, or at some other point that supports a deception. The virtually universal promotion and distribution of “contraception” and sterilization (now the most common family planning method), various artificial reproductive techniques, the wide use of hysterectomy, and cosmetic reconstructive surgery are all further examples of the medical community's efforts to play God and ignore God's perfect design for the human body.

The legal/political system is similarly duplicitous as judges, legislators, and other elected officials deny clear evidence that life begins at conception and progresses in an orderly continuous fashion until death. Current efforts to redefine marriage to include same sex couples is another example.

What about religious leaders? Many denominations have abandoned the sanctity of human life principle or the principles that define the meaning of human sexuality, and the definition and purpose of marriage.

Because of our abandonment of these principles, nature is fighting back with an epidemic of epidemics that are manmade: abortion, sterilization, infertility, sexually transmitted diseases, breast cancer, suicide, depression, homosexuality, out-of-wedlock births, divorce, crime, etc. Most of these were once rare phenomena that were considered abnormal. Because of increased incidence, they have achieved ‘normal’ status.

It seems that there are only two remaining bastions of normalcy and rationality in our culture today — the technical community for which integrity is still the norm, and the Holy Roman Catholic Church (all these adjectives are necessary to make a clear distinction from common Catholic practice). In the latter, we have the only remaining moral authority in the world, and to a lesser extent in the USA due to the clergy and politician scandals of recent headlines. Not yet on the bishops’ radar screens are the scandals of the laity, including the Catholic medical community alluded to above. Over 99% of Catholic Ob/Gyns are not in agreement with their Church in the area of reproductive health care. Catholics contracept, sterilize, abort and use IVF at virtually the same rates as the rest of the population. Considering these sad facts, perhaps science and technology offer our only hope for achieving a pro-life society. If that is the case, this Pro-Life Science and Technology Symposium may be our best cause for hope.

With that in mind, I’d like to turn now to the field of aerodynamics for lessons and analogies that can contribute to a culture of life.

#### Aerodynamics

Recall that there is no general solution to the Navier-Stokes Equations discussed earlier. But there are many exact and approximate solutions for special shapes and circumstances, and when simplifying assumptions are possible in certain flows, or parts of the flow field. Consider the low speed flow over a wing, or for simplicity, the 2-dimensional flow over the center airfoil of a flying wing.

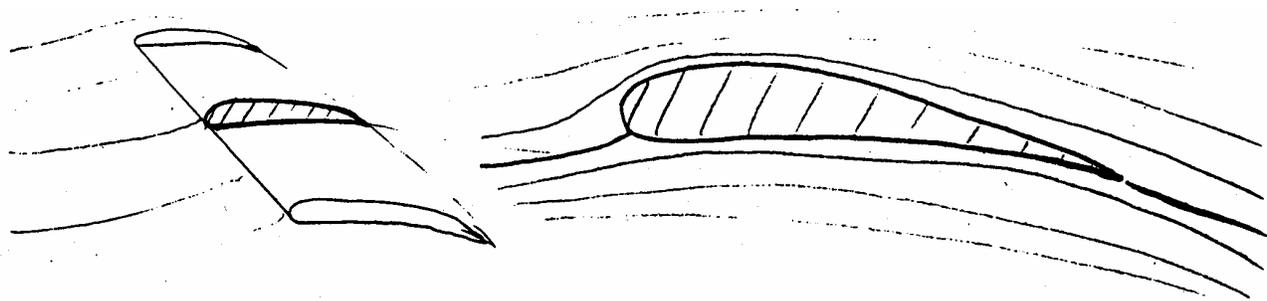


Figure 7. 2-Dimensional Flow over an Airfoil

Over much of the flow field, the effects of viscosity are negligible and the flow can be assumed to be “irrotational.” Physically, this means that the fluid (air) remains in layers without tripping, stumbling, and rolling. Mathematically, it means that the N-S Equations linearize and are thus considerably simplified to the following.

$$\delta u / \delta x + \delta v / \delta y = 0 \quad \delta u / \delta y - \delta v / \delta x = 0$$

$$\mathbf{V} = (u,v) = \nabla \Phi(x,y) \Rightarrow \nabla^2 \Phi = 0$$

Figure 8. Incompressible, Irrotational — Potential Flow Equations

This is pure delight to the mathematician because a huge body of theoretical and practical solutions and theory is available from “Potential Theory”. For example, the exact solution to the flow over a circular cylinder is obtainable from potential theory as follows.

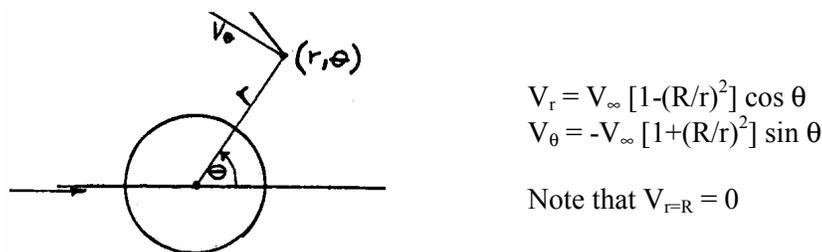


Figure 9. Flow over a Circular Cylinder

The circular cylinder produces no lift, so isn't a very interesting airfoil, but it can be transformed into flat plates and airfoils. The flow field solution can be similarly transformed to yield interesting solutions for the velocity and pressure fields that correspond to flow over these shapes.

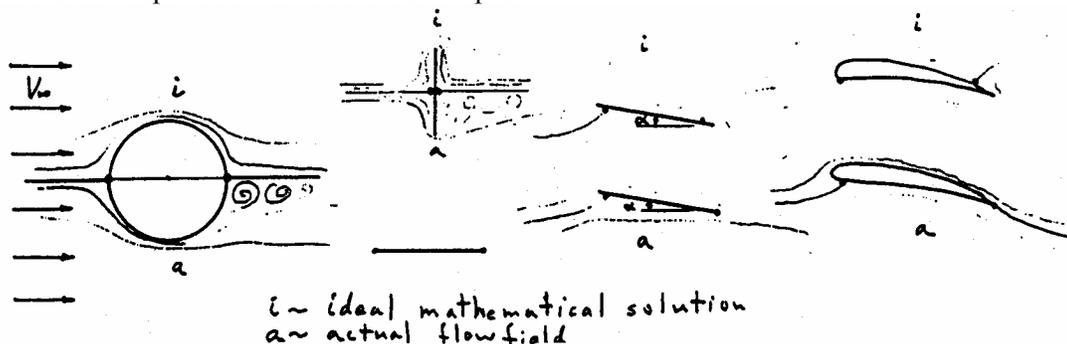


Figure 10. Flow over Plates and Airfoil – Comparison of Mathematical and Physical Models

The physical reality and mathematical solution are not in good agreement because the effect of viscosity on the flow field has been neglected by the irrotationality simplification. This is especially important for the analysis of flow over the airfoil and plate at an angle of attack ( $\alpha$ ) where lift is developed in a real flow. You have undoubtedly experienced the lift and drag of your hand held outside the window of a fast moving vehicle—large drag when perpendicular to the flow field ( $\alpha=90^\circ$ ) and strong lift when held at a modest angle of attack,  $\alpha$ .

Figure 11. depicts the general layout for an aircraft in a flow field. The over all goal of an aeronautical engineer (generally speaking) is to design the “best” airplane for accomplishing a given mission at minimum cost. Optimization and tradeoffs are the name of the game in aircraft design. It has been claimed that aeronautical engineering is the most demanding of the engineering disciplines because all of the main sub-disciplines (aerodynamics, structures, propulsion, and flight control) strongly impact and interact with each other. This can be seen by realizing that the aircraft size and range requirements determine lift and propulsion requirements and these all impact the structural requirements. All components must be designed for minimum weight because every extra pound of weight requires extra lift and therefore extra structure and drag, which increases the weight and propulsion requirements, and round and round we go.

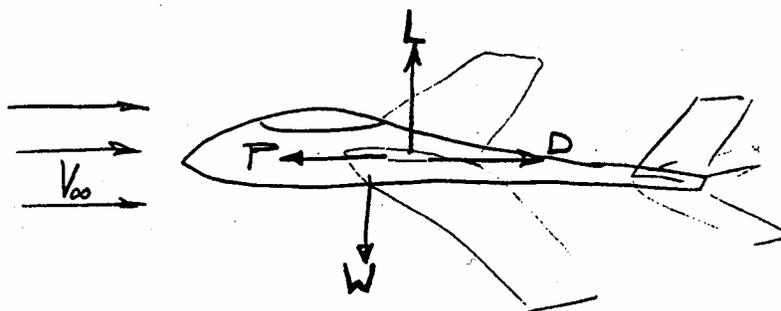


Figure 11. General depiction of an aircraft in a flow field

A rather simple description of the aircraft design problem is to say that we want to create a mathematical model for the flow over an aircraft so we can calculate lift (L) and drag (D). We will endeavor to improve the design to increase L or decrease D.

The irrotational flow assumption that gave us the linear potential equation is the basis for the aerodynamic analysis from which I plan to draw pro-life insight. The linearity allows the mathematician/engineer to superimpose (add together) solutions to the potential equation to generate a solution that meets the boundary condition at the surface of the aircraft — that there will be no flow through the solid surface/skin of the aircraft.

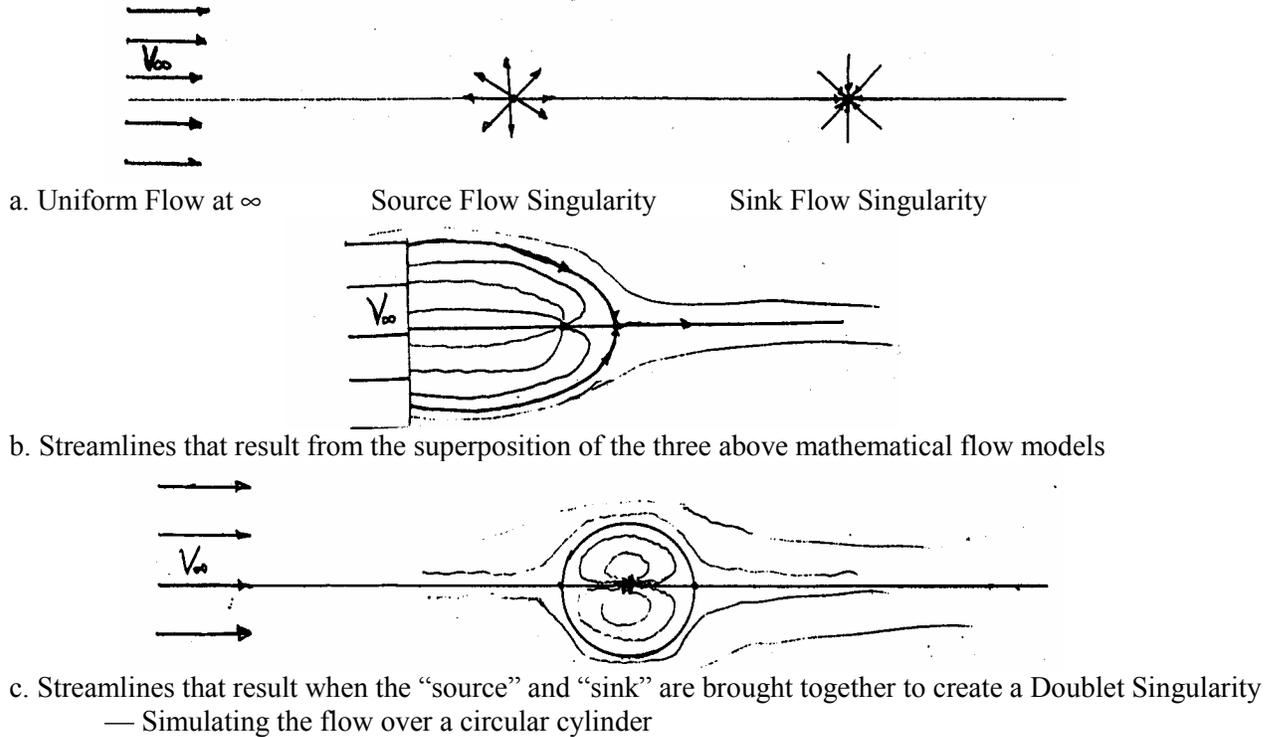


Figure 12. Potential Theory Modeling of Flow over a Circular Cylinder

Adding “a vortex singularity of strength  $\Gamma$ ” at the center of the cylinder distorts the flow field and causes lift as shown in Figure 12. c where it can be shown that  $L = \int \Gamma V_\infty bc$ . By transforming the circular cylinder into an airfoil shaped cylinder and applying the same transformation to the circular flow solution, we get the flow field over the airfoil as depicted in Figure 13. Here the circulation must be adjusted so the trailing edge is the rear stagnation point making the flow field look like we want it to look like for flight.

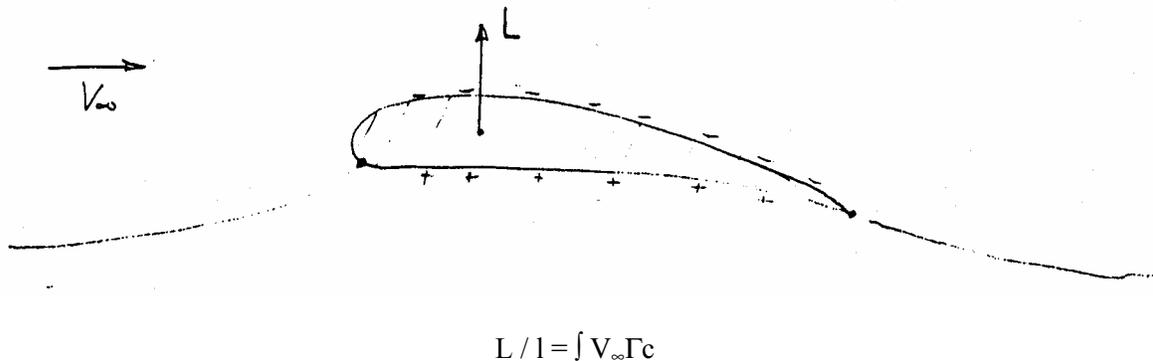


Figure 13. Potential Flow Modeling of Flow over an Airfoil

What is going on here? Viscosity is necessary to keep the flow attached to the low-pressure upper surface of the airfoil all the way to the trailing edge. Some accounting for this viscous effect must be made to produce a mathematical model that conforms to the physical reality. The addition of circulation is an artifice that accomplishes that end. Adding the ‘right’ amount of circulation causes the mathematical fluid to leave the trailing edge smoothly.

For improved mathematical modeling, the natural viscosity in the fluid must be accounted for with increased precision. Three strategies are historically common in aerodynamics.

Strategy C: Solve the linear potential equation including the right circulation to give smooth flow off the training edge. The solution yields the surface velocity distribution from which the surface pressure can be computed using Bernoulli’s Equation. The  $L$  and  $D_L$  can be calculated from the pressure distribution.

Strategy B: Supplement the solution from Strategy C by using those surface velocity and pressure distributions as input to the “boundary-layer equations” which approximate the Navier-Stokes Equations for the thin layer of fluid near the surface, where viscous effects dominate. The potential solution approach of Strategy C in effect treated this viscous boundary layer as a velocity discontinuity—or singularity— where the fluid velocity is, both zero (at the surface in real life) and a non-zero value calculated by the potential theory. This boundary layer edge velocity is the outer value for the fluid velocity in the boundary layer. The boundary layer thus examines in detail the transition of the velocity from zero at the surface to its value at the outer edge of the boundary layer, which is the inner edge of the potential flow. This boundary layer equation solution yields the shear stress on the surface as a result of the fluid sticking to the surface. The shear stress is used to compute drag due to friction,  $D_f$ .

Strategy A: Solve the exact Navier-Stokes Equations using approximate analytical methods, or numerical methods, or a combination of these. These results should be the most accurate representation of the actual physical flow. Actually solving the equations is also the more challenging of the three strategies.

The point of this long discussion of fundamental aerodynamics is to demonstrate that the role of viscosity must be accounted for to get meaningful results. The viscosity effect may be accounted for in a gross way, by the circulation artifice, by a complimentary or parallel calculation using the boundary layer equations, or by embracing the most exact, and most difficult, problem—solving the Navier-Stokes Equations.

#### Viscosity-Contraception Analogy

The analogy connecting aerodynamics and the pro-life movement hinges on viscosity and contraception playing similar roles in the different fields. The following parallel statements will demonstrate the analogous nature of viscosity and contraception. The expectation is that these statements will be seen as challenging and enlightening.

Viscosity	is the most fundamental and significant phenomenon in	aerodynamics.
Contraception		the culture of death.

Viscosity	must be accounted for to get a reasonable understanding of	aerodynamic lift.
Contraception		abortion.

Viscosity	accountability with increasing precision results in increasing understanding of	aerodynamics.
Contraception		the culture of death.

The anti-abortion/pro-life movement exhibits various strategies for addressing the contraception issue, similar to the variety of strategies for addressing viscosity in aerodynamics. The following is a comparison and matching of these strategies.

### Strategy C

In this category are those aerodynamicists/pro-lifers who don't recognize, or recognize but deny, the impact of viscosity/contraception on aerodynamics/culture. For the aerodynamicist, this is analysis with so there is no circulation and thus no lift. For the pro-lifer, excluding the impact of contraception results in no understanding of the underlying cause for abortion—the effect they are trying to eliminate. [No viscosity;  $\Gamma=0$ ] is analogous to [Contraception isn't an issue; we take no position on birth control.]

### Strategy C+

Here the aerodynamicist employs the global artifice of circulation  $\Gamma > 0$  to account for the effects of viscosity. In the pro-life venue, contraception is acknowledged to be immoral or at least problematic, but abortion is viewed as a sufficiently difficult and more serious problem without adding contraception to the agenda. The attitude is “we need to solve the abortion problem by legal, legislative, judicial, or executive action. Then, maybe, we'll tackle contraception.”

### Strategy B

The aerodynamicist recognizes the essential role of viscosity and accounts for it by complimenting the potential flow solution for surface pressure and velocity with a boundary layer equation solution for the flow inside the thin viscous layer near the body. They are thus able to calculate friction drag in addition to lift, and drag due to lift. Pro-lifers in this category recognize contraception as the root cause for most abortion. Like John-Paul II, they see contraception and abortion as fruits of the same tree. They acknowledge the findings from abortion mills and pregnancy support centers that 2/3rds of clients claim contraceptive failure for their unplanned pregnancy and “need” to consider abortion. The morning after pill and the birth control pill (and all hormonal birth control, regardless of the delivery method) are recognized as potentially abortifacient, as admitted by the manufacturers, and by some estimates accounts for multi millions more abortions than are done surgically. Pro-lifers in this category treat both contraception and abortion as evil and confront both.

### Strategy A

By solving the complete Navier-Stokes Equations, the aerodynamicist fully accounts for viscosity and is able to exactly solve the problem and accurately describe the flow field and resultant aerodynamic forces. The parallel pro-lifer recognizes contraception as not only fostering and fueling abortion, but also as having a pervasive effect on all of society. These effects extend certainly to our attitudes regarding the meaning and purpose of human sexuality and reach into every segment of our society—Church, marriage, homosexual agenda, education, urban sprawl, crime, government, the arts, and entertainment. It would take an entire symposium to document this claim. The One More Soul “Dandelion and Rose Poster” attempts to illustrate some of the harms that flow from readily available and widely used contraception, including sterilization.

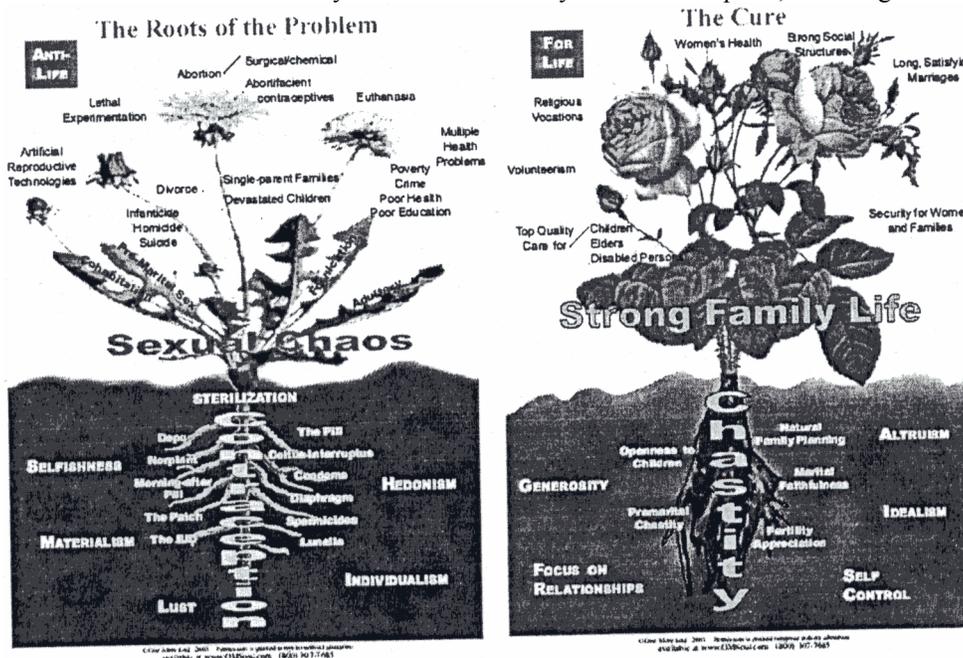


Figure 14. Dandelion and Rose Poster

At some point, all analogies fail. Viscosity is bad because it causes skin friction drag. But, viscosity is good because it is necessary for the generation of lift. The resulting aerospace industry is a result of the Wright brothers pioneering research, design, and manufacturing of wings right here in Dayton Ohio. They bought the wood for their aircraft structures from Requarth Lumber Company, with their lumber yard just a couple blocks east of us here today. On the other hand, contraception is intrinsically evil. There is no good contraception. Yes it is true that God is very good at bringing good out of evil, but it is never licit to do evil so that good will result. That is a fundamental principle of morality and ethics. Some may consider “natural family planning” as a form of contraception that is good. But, no NFP advocate would categorize NFP as a contraceptive method.

Stemming from the above discussion, my final analogy is of the Complete Aerodynamicist and the Complete Pro-Lifer.

Complete Aerodynamicist (Department)	Complete Pro-Lifer (Movement)
Is knowledgeable and capable in incompressible, flow, subsonic, transonic, supersonic, hypersonic, orbital, viscous, inviscid, plasma, laminar, turbulent, separated, irrotational, potential flows,, shock waves, boundary layers, potential solutions similarity solutions, analytic, expansion, inner and outer matching, finite difference, and paneling methods.	Is knowledgeable and capable in abortion, contraception, euthanasia, death penalty, nutrition & hydration, brain death, cloning, stem cells, war, assassination, IVF, frozen embryos, adoption, divorce, STDs, breast cancer, pornography, chastity, crime, single parenting, urban sprawl, marriage, theology, natural family planning, and children as supreme gift.

The point is that an aerodynamicist cannot be an expert on every aspect of aerodynamics, and a pro-lifer cannot be an authority on all the pro-life issues. However, it is necessary for both the aerodynamicist and the pro-lifer to be familiar with their field and understand how the components fit together, including the understanding of what drives and what is most important. A seamless garment mentality is helpful.

#### Conclusion

Mathematical concepts of singularity, discontinuity, and function theory provide a different and interesting way to look at life—human life and supernatural life. Aerodynamics provides interesting analogies with pro-life that can be supportive of strategies and philosophies that have common value. The analogy between viscosity and contraception appears to be particularly strong and supports a pro-life movement that is broad based in its concerns and honest about the underlying cause of much of what characterizes the culture of death.