

AESTHETICS OF HIGH-TECH INTIMIDATION. F-35 LIGHTNING II AND A DESIGN FOR HUMAN RECEPTION

By Jan-Henrik Walter

“They felt as secure as spectators at a bullfight; they risked their money perhaps on the result, but that was all. And such ideas of war as the common Americans possessed were derived from the limited, picturesque, adventurous war of the past. They saw war as they saw history, through an iridescent mist, deodorised, scented indeed, with all its essential cruelties tactfully hidden away.”
– H.G. Wells, *The War in The Air* (1908)

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Form follows what function?

If the development of military fighter planes were only to follow the objective of creating the fastest and most efficient machines of their kind, while under the pressure of tight cost-benefit calculations, one must subsequently wonder about any aesthetic power inherent to the finished products. One can speculate about whether a visual impact is deliberately induced or merely a spandrel, the result of military and engineering necessities. In both cases, the visual design of modern warplanes emphasizes the fascination, that many people feel for them: The F-35 Lightning II is designed to be the world's most superior combat aircraft, created for ever more demanding attack and defence missions of the United States Air Force, Marine Corps and Navy.¹

The *aesthetics* of the F-35 Lightning II are relevant not only because its design inevitably expresses *something* to both a maker of military decisions and to a threatened target on ground-level, but also because the F-35 as a mega-project is closely interwoven with international business, politics and the public sphere.² As carriers of action and spectacle, mod-

ern fighter planes regularly appear in mainstream blockbusters from *Top Gun* to *Transformers*, which is why the U.S. Air Force even runs its own office in Los Angeles, to arrange and subsidize corresponding Hollywood productions.³ For film-makers and producers to tap into this potential of financial support and real effects, resulting audio-visual products of course have to serve the "best interest of public understanding of the U.S. Armed Forces", their recruiting programs, and U.S. policy.⁴ Critical productions are excluded, steepening a potential slope in visual quality and reach between voices of the Pentagon and its opposition.

In real conflict scenarios moreover, the *aesthetics* of operated war equipment do have measurable impact on decision-making of both crew and pilots.⁵ And even as a strategy, any aesthetic effects of the F-35 would not stand alone in the military realm: War paintings for intimidation are element of many cultures,⁶ uniforms are used to create a shared sense of identity,⁷ camouflages to cover up troops, artificial forces to fool

1 Lockheed Martin Corporation, The Multi-variant, Multirole 5th Generation Fighter (2019), <https://www.f35.com/about>, access: April 10, 2019, 13:05am.

2 The Economist, Dancing on the grave of the F-22. *The Economist* (July 22, 2009), <https://www.economist.com/democracy-in-america/2009/07/22/dancing-on-the-grave-of-the-f-22>, access: November 28, 2018, 03:45pm.

3 Air Force Entertainment Liaison Office, Breaking barriers since 1947 (2019), <https://www.airforcehollywood.af.mil/>, access: April 10, 2019, 01:20pm. An official Twitter-account to the F-35 Lightning II can be found via <https://twitter.com/thef35>.

4 Jim Gregory, *The development of Hollywood's relationship with the military: A guide for filmmakers and military entertainment liaison officers* (University of Southern California, 2008).

5 Erik Hedlund and Joseph Soeters, Reflections on Swedish Peacekeepers' Self-image and Dilemmas of Peacekeeping. *International Peacekeeping* 17/3 (2010), pp. 408–14.

6 Jimmy Nelson, *Before They Pass Away* (Kempen 2013).

7 Sean Real, Razzle Dazzle (2012), <https://99percentinvisible.org/episode/episode-65-razzle-dazzle/>, access: April 10, 2019, 01:30pm.



Fig 1: Lockheed Martin F-35 Lightning II in flight Falcon Photography, Lockheed Martin F-35, built 2017 (2019), <https://flic.kr/p/2jbTcAX>, access: March 17, 2021, 10:45pm.

opponents⁸ and the sound design of a dive bomber's Jericho trumpet to terrify earthbound targets.⁹ All these are military practices, whose modus of operation is primarily in the realm of aesthetics. An aggravation of this *aesthetic thinking* is infamously illustrated by the strategy of U.S. forces at the beginning of the 2003 invasion of Iraq, which was titled by officials as *Shock and Awe*, and was presented by domestic media, mostly as such.¹⁰ In Qatar 2003, US General Tommy

8 Katie Mingle, Show of Force (2015), <https://99percentinvisible.org/episode/show-of-force/>, access: April 10, 2019, 01:30pm.

9 Johann Althaus, Technikgeschichte: Stukas waren Hitlers mächtigste Waffe im Blitzkrieg. *Welt* (June 25, 2015), <https://www.welt.de/geschichte/zweiter-weltkrieg/article143021882/Stukas-waren-Hitlers-maechtigste-Waffe-im-Blitzkrieg.html>, access: April 10, 2019, 01:45pm; Laurenz Demps and Carl-Ludwig Paeschke, *Flughafen Tempelhof. Die Geschichte einer Legende*, Laurenz Demps, Carl-Ludwig Paeschke (Berlin1998).

10 Mitchell Hobbs, Reflections on the reality of the Iraq wars: the demise of Baudrillard's search for truth? *The Australian Sociological Association* (Newcastle 2007); Brian Whitaker, Flags in the Dust. *The Guardian* (March 24, 2003), <http://www.theguardian.com/world/2003/mar/24/worlddispatch.iraq>, access: March 15, 2021, 05:30pm.

Franks has to say:

*This will be a campaign unlike any other in history. A campaign characterized by shock, by surprise, by flexibility, by the employment of precise munitions on a scale never before seen, and by the application of overwhelming force.*¹¹

Though the civilian casualties of the Iraq war expose, that said bombing campaign could neither hold the promise of precision nor deterrence, leaving military goals unclear.¹²

Meanwhile, the very idea of *spectacular* warfare for military use is nothing new: Already in World War I, Lieutenant Colonel (*Durch-*) Bruchmüller is known to have deployed artillery on the Western Front, in which a precise hit on the enemy was deemed less important to victo-

11 *The Oxford Dictionary of Phrase and Fable*, 2nd ed. (Oxford 2005), <http://www.oxfordreference.com/view/10.1093/oi/authority.20110803100502693>, access: April 10, 01:30pm.

12 IBC and Oxford Research Group, IBC Press Release 12 (2005), <https://www.iraqbodycount.org/analysis/reference/press-releases/12/>, access: March 15, 2021, 5:50pm; Whitaker, Flags in the Dust.

ry, than a sheer intimidating number of shells.¹³

It is a similar intimidation, mixed with supposed superiority and technological progressiveness, that make the F-35 Lightning II an intriguing object for investigation: What role do design and aesthetics play in the perception of a state-of-the-art fighter jet and its usage on military missions? Does high-tech imply precision? Does slick imply just?

Currently the US-American stealth plane is being negotiated in public discourse between breakdown jet and wonder weapon.¹⁴ For the high-tech aesthetics of the F-35 also communicate a well-founded mistrust as to whether functions under its glossy surface work as its design promises: launch problems, little space for armament and unclear production costs are causing customers to cancel orders.¹⁵ Added to this, is the ongoing replacement by drones and even the replacement by old-fashioned propeller machines, which are deemed much more cost-effective to use against technologically inferior enemies:¹⁶

*The country currently depends on an ever-decreasing number of extremely capable but eye-wateringly expensive multi-mission platforms which, if lost at the outset of a conflict, would be impossible to replace. A single F-35 aircraft can cost well over \$100m, an attack submarine \$2.7bn and a Ford-class carrier with all its aircraft approaching \$20bn.*¹⁷

Nevertheless the cost and mixed opinions, these modern fighter planes fulfil a function: within the technological arms race of international parties, they serve as a product of security design (*Sicherheitsdesign*). That label goes back to Friedrich von Borries, who distinguishes between the extent, to which any manifestation of security design such as the F-35 is creating liberties (*entwerfen*) while constraining others (*unterwerfen*):

*Not only everyday objects of daily use are the result of design processes, but also weapons and surveillance technology. They are also subjugating when they are used for an enabling goal.*¹⁸

A subjugating design “confirms existing relations of domination and power by manifesting them both functionally and aesthetically.”¹⁹

The following text examines this aesthetic manifestation of the F-35 Lightning II in terms of industry design principles, depicting why modern fighter jets

13 Michael Sontheimer, *Der Krieg im Reich: Wir hauen ein Loch hinein. Der Spiegel* (1/2004), <https://magazin.spiegel.de/EpubDelivery/spiegel/pdf/30300038>, access: April 10, 2019, 01:30pm.

14 Valerie Insinna, *Inside America's Dysfunctional Trillion-Dollar Fighter-Jet Program. The New York Times* (August 21, 2019), <https://www.nytimes.com/2019/08/21/magazine/f35-joint-strike-fighter-program.html>, access: March 17, 2021, 07:30pm.

15 Gernot Kramer, *F-35: Superjet oder teuerster Pannenvogel der Geschichte? Stern* (July 14, 2016), https://www.stern.de/digital/technik/f-35-superjet-oder-teuerster-pannenvogel-der-geschichte-6949624.html#mg-0_1554633677398, access: April 10, 2019, 01:45pm.

16 *The Economist*, *Air power on the cheap. The Economist* (September 20, 2010), <https://www.economist.com/technology-quarterly/2010/09/20/air-power-on-the-cheap>, access: April 10, 2019, 01:45pm.

17 *The Economist*, *Getting to grips with military robotics. The Economist* (January 25, 2018), <https://www.economist.com/special-report/2018/01/25/getting-to-grips-with-military-robotics>, access: April 10, 2019, 01:45pm.

18 Friedrich von Borries, *Weltentwerfen: Eine politische Designtheorie*, 2nd ed. (Berlin 2017), p. 87.

19 *Ibid.*, p. 21.

look the way they do. A special emphasis lies on the qualities of high-tech surfaces, as it is often ambiguous, what a high-tech product actually does, how it works, what it represents and most interestingly, what it excludes from its representative capabilities. Since it is not the first time, that fighter planes are subject to design and aesthetics, the Italian *Aeropittura* (that is linked to Mussolini's fascist regime in World War II) will be visited for comparison. It is then concluded, how the U.S. Armed Forces may do benefit from any specific high-tech impressions, that the F-35 Lightning II might evoke.

From tech to product: Deconstructing the F-35's aesthetics

For economic reasons the F-35 exists in three very similar but slightly different versions, each optimized for their usage in the Marines, U.S. Air Force and Navy. The most common F-35A is used for *analysis* in here and serves as a proxy for the complete series.²⁰

Where does form come from? First of all, jets must fly. In the case of war-

planes, they must fly really fast: The F-35's prominent delta-wing shape leads to a special form of airflow, that is able to provide a high lift and stability, that is particularly suited to super-sonic aircraft, and leaves more room for fuel and armament.²¹ In visual theory, the use of those delta forms has a long tradition as an expression of masculinity, threat or activity. Triangles are seen as warning, directional or even protective.²² The F-35 models A and B form a very compact and therefore clear of these deltas with a relatively small wing-span of about 10m. This compactness is necessary because the F-35 Model B must fit into existing amphibious attack ships of the U.S. Navy.²³

Many further form factors trace back to *design for stealth*: The invisibility in front of radar is achieved by the fact, that incoming rays from search devices are not reflected back to the sender, but are instead reflected away or absorbed by the surface.²⁴ To reduce radar cross section, the F-35 uses planar surfaces with sharp

21 E.g. Christian Breitsamter, Deltaflügel Aerodynamik. Technische Universität München, http://www.aer.mw.tum.de/fileadmin/tumwaer/www/pdf/lehre/Praktikum-aeroflugzeug/Versuch_05.pdf, access: April 10, 02:30pm; Greg Dimitriadis, Fighter Aircraft Design. Liège université (2018), <http://www.ltas-cm3.ulg.ac.be/AERO0023-1/ConceptionAeroFighter.pdf>, access: March 17, 2021, 04:10pm.

22 E.g. Daniela Sternad, Gestaltungsgrundlagen (2019), <http://www.grafixerin.com/bilder/Gestaltungsgesetze.pdf>, access: April 10, 2019, 02:30pm.

23 Eric S. Ryberg, The Influence of Ship Configuration on the Design of the Joint Strike Fighter. Naval Surface Warfare Center Dahlgren Division (2002), <https://apps.dtic.mil/dtic/tr/fulltext/u2/a399988.pdf>, access: April 10, 2019, 02:30pm.

24 Markus Baecker, Passivradar raubt Stealth-Jets die Tarnkappe. *Der Spiegel* (September 14, 2012), <http://www.spiegel.de/wissenschaft/technik/passivradar-nimmt-stealth-jets-die-tarnkappe-a-855711.html>, access: April 10, 2019, 02:30pm.

20 Lockheed Martin Corporation, Three Variants, Common Capability (2019), <https://www.f35.com/about/variants>, access: April 10, 2019, 04:45pm.



Fig 2: Civil business airliner Hawker 850XP with rounded body and soft edges. Eugene Butler, Hawker Beechcraft 850XP (2011), https://en.wikipedia.org/wiki/File:Hawker_Beechcraft_850XP_Private_JP7325778.jpg, access: March 17, 2021: 09:15pm.

edges.²⁵ Roundings are mostly avoided, which marks a strong design differentiation to the civil aviation industry (Figure 2). Stealth requirements therefore create a sharp, polygonal look, while this does not necessarily mean, that aerodynamic features are lost. Possible directions of radar reflection are further minimized by wing and body edges following parallel lines and angles.²⁶ This high parallelism in the F-35 then ensures visual order and is usually considered a token of *good design*.

²⁵ Brett S. Haisty, *Affordable Stealth*. Lockheed Martin Aeronautics (2000), <http://www.f22fighter.com/AffordableStealth.pdf>, access: April 10, 2019, 02:30pm .

²⁶ Haisty, *Affordable Stealth*.

The resulting sharp and polygonal language can be assessed with Chandra,²⁷ who has investigated influence of form and shape on emotional affect for product development. In particular, affects of dynamism and intimidation can be attributed to a sharp-edged polygonal look with convex structural transitions, a design that is close to the F-35's shape:

[P]olygons are the clear choice both for large as well as sharp fillets, though sharp fillet has an edge [...] Sharp fillet polygons with flat convex surfaces generate a dynamic character supplemented by an element of intimidation.

A particularly high intimidation effect

²⁷ Sushil Chandra, *Aesthetics: Quantification and Deconstruction. A Case Study in Motorcycles* (Singapore 2018).

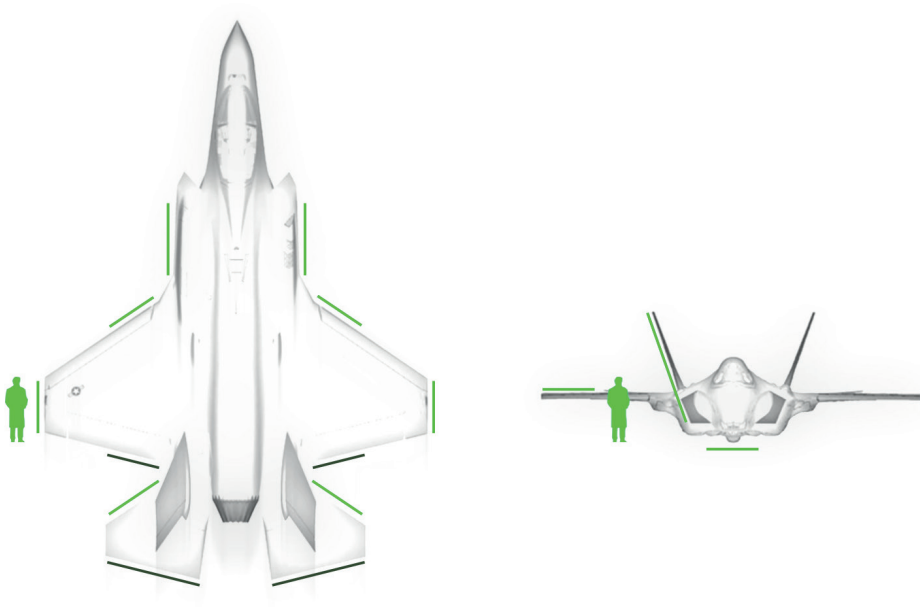


Fig. 3: Parallel lines in the F-35 for reasons of stealth, to minimize possible directions of reflection.

is achieved with high dynamics and a simple, uniform shape.²⁸ This uniformity is created by a clear silhouette, since the F-35's armament in the form of bombs or missiles must be stored in the interior of the plane, in order to keep the reflecting surfaces further as small as possible.²⁹ The simple form resulting here without any visually disruptive weapon systems, additionally facilitates the Gestalt distinction between a figure and ground; increasing said *pleasantness*, with which the F-35 is visually processed.³⁰

Modern fighter jets are usually coated

in grey, as this colour camouflages any aircraft particularly well against the sky in its various lighting moods. Surprisingly, a warm pink also makes for good camouflage. However legend has it, that this encountered the strong opposition of many male U.S. Air Force personnel.³¹ Simple grey meanwhile is a valid design option, because visual identification through the eye of a pilot became unimportant in modern aerial warfare, while being crucial in conflicts of the past. Today, both colour and flag are no longer relevant for the distinction between friend and foe.³² While visual identity

28 Ibid., p. 176.

29 John Hemmerdinger, Lockheed Martin's F-35A Joint Strike Fighter has conducted its first live-fire test. *Flight Global* (2013), <https://www.flightglobal.com/news/articles/f-35b-launches-air-to-air-missile-in-test-392434/>, access: April 10, 2019, 02:40pm.

30 Sternad, Gestaltungsgrundlagen.

31 Alan Radecki, Real Men Don't Fly Pink Airplanes (2012), http://vintageairphotos.blogspot.com/2012_01_01_archive.html, access: April 10, 2019, 05:00pm.

32 Kris Osborn, The Stealth F-35 Uses a "Threat Library" To Wage War. *The National Interest* (October 23, 2018), <https://nationalinterest.org/blog/buzz/stealth-f-35-uses-threat-library-wage-war-heres->



Fig. 4: The asymmetric bomber Blohm & Voss BV 141 in 1942. Bundesarchiv, Blohm & Voss BV 14. (2020), https://de.wikipedia.org/wiki/Blohm_%26_Voss_BV_141#/media/Datei:Bundesarchiv_Bild_183-B21073_Aufkl%C3%A4rungsflugzeug_Blohm_Vo%C3%9F_BV_141.jpg, access: March 20, 2021, 03:00pm.

fades, Chandra further concludes that the applied tones of grey are dynamizing in effect, while blacks are most likely to be threatening.³³

It should also be mentioned that the F-35 is a symmetrical aircraft. This does not have to be the case, as the light bomber Blohm & Voss BV 141 of 1938 exemplarily shows (Figure 4). Symmetry is relevant in all forms of art and is of course considered one of the foundations of visual harmony. Human sensitivity to symmetry is well researched: Especially adults can process symmetrical stimuli more quickly, accurately and sustainably. So here, too, the plane's design has an effect on the simplicity of cognitive processing. In other words, its outer shape does not constitute to optical disturbance.³⁴

what-means-34132, access: April 10, 2019, 02:45pm.

33 Chandra, *Aesthetics: Quantification and Deconstruction*, p. 139.

34 Yi Huang et al, The aesthetic preference for symmetry dissociates from early-emerging attention to symmetry. *Scientific Reports* 8/1 (2018).

If one continues to look at the F-35 Lightning II through the eyes of creative practice, composition particularly stands out: Composition describes the distribution of elements on a surface and the relationship of those elements to each other. Three tools used in practice are the golden ratio,³⁵ its simplification in the rule of thirds³⁶ and Tschichold's golden canon.³⁷

The golden ratio describes the supposedly natural and beautiful ratio of 1:1.618. It served designers of antiquity, the renaissance and modern times as a grid to create especially *harmonious* compositions.³⁸

The rule of thirds is applied in such a way, that focus points are located at the intersections of grid lines, that divide the image equally into nine areas.³⁹

Lastly, Tschichold's golden canon describes a harmonic distribution derived from the golden ratio, which was developed for print.⁴⁰ Focus points are aimed to be located at intersecting lines and content should sit in the designated black frames.

Although no statement about a deliberate design process can be made, a specific aesthetic impression is underlined:

35 Gary B. Meisner and Rafael Aurajo, *The Golden Ratio: The Divine Beauty of Mathematics* (New York 2018).

36 E.g. Garry Reynolds, *Zen oder die Kunst der Präsentation: mit einfachen Ideen gestalten und präsentieren* (London 2008), p. 151.

37 E.g. Richard Hendel, *On Book Design* (New Haven 1998), p. 34.

38 Meisner and Rafael Aurajo, *The Golden Ratio: The Divine Beauty of Mathematics*.

39 Reynolds, *Zen oder die Kunst der Präsentation: mit einfachen Ideen gestalten und präsentieren*.

40 Hendel, *On Book Design*.

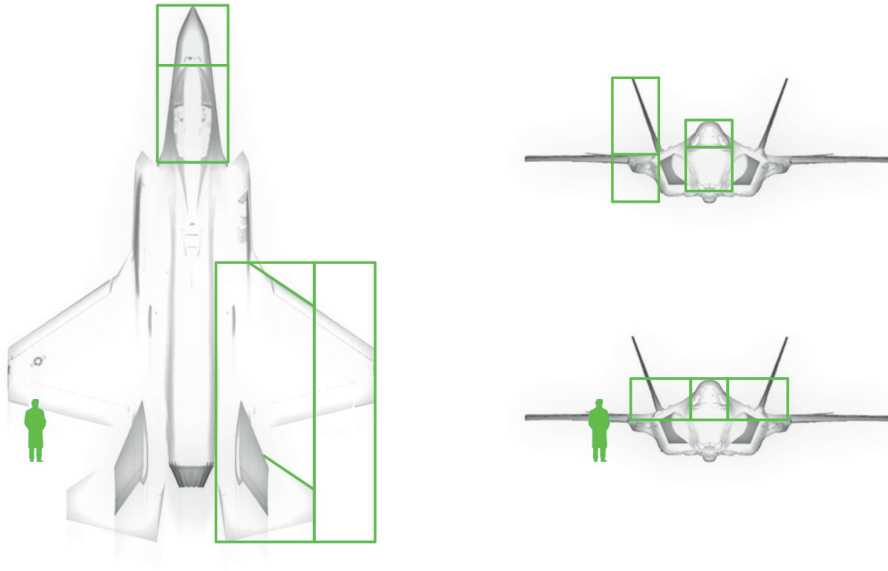


Fig. 5: The height of F-35's wings compared to the height of the aircraft, the dimensions of the cockpit compared to the fuselage and wing-span relative to jet engine fall within the grid of the *golden ratio*.

The F-35 is a harmoniously composed product with inherent visual balance. A clear silhouette, symmetry and monochrome camouflage favor processing of stimuli and simplify the resulting form. Straight lines and visual order indicate professionalism and make the F-35 appear clear; while the strong delta silhouette and sharp-edged polygony depict characteristics of dynamism, intimidation and also masculinity.⁴¹

Notice, that this very basic analysis does not yet include any notions of high-tech, which we will add in the following paragraphs.

Beyond the surfaces of high-tech

From the invention of the wheel, to bronze swords, steam engines, cell phones and autonomous automobiles, each era has its own form of high technology. With the introduction of electronics and microelectronics into machines, however, an aesthetic moment arises in which the functioning principle of a machine can *disappear* under its surface.⁴² Form then no longer *necessarily* has to follow function. Surface language

41 Chandra, *Aesthetics: Quantification and Deconstruction*.

42 Barry Brummet, *Rhetoric of machine aesthetics* (Westport 1999).

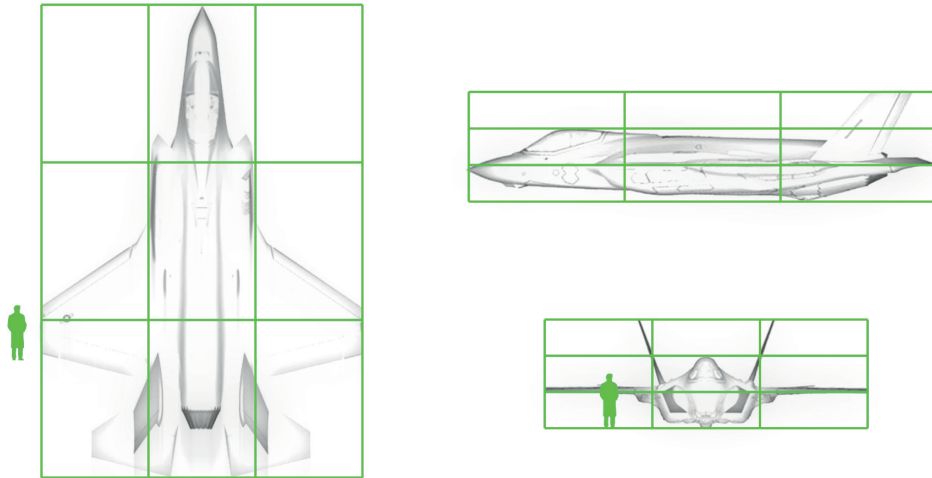


Fig. 6: The fuselage, which fills the middle third of the wingspan, fits neatly into the *grid of thirds*. In the horizontal section, heights of wings as well as nose fulfil this compositional guideline.

of high-tech products is increasingly independent from mechanical constraints and designers are supposedly more free to choose, which information said surfaces should embody – with it however comes the task of expressing, what the high-tech product is actually *supposed to do*.

Machines of the mech-tech era convey both their underlying power and functional principle through perceptible processes of combustion, oscillation and also through sheer noise, which translate to the outside of their machine core; while the opposite tendency of high-tech is to create a world of more minimalistic, smaller and orderly shapes. High-tech and electro-tech enable devices to work in quiet and without vibration. The very principle of operation becomes less intrusive and the form of force develop-

ment is rendered into the background.⁴³ Operations do not necessarily reveal themselves to human senses and a visualization via the tools of experts is needed. In the case of automobiles, the conflict between high-tech and mech-tech aesthetics is very sharp, because the latter has established itself on the automobile market for years: Authentic machine sound has become a strong emotional argument for sales and marketing.⁴⁴ Thus, high-tech cars with electric motors have to artificially create their soundscape, that is, they have to *fake mech-tech*, for both reasons of driving pleasure and road security. A selection of the accentuated high technology takes place, and with it a designed selection of affect.

⁴³ Ibid., p. 57.

⁴⁴ Werner Pluta, Klang erweckt Emotion. *Golem* (2018), <https://www.golem.de/news/sounddesign-wie-vertont-man-ein-geraeschloes-auto-1802-132809-3.html>, access: April 10, 2019, 02:55pm.

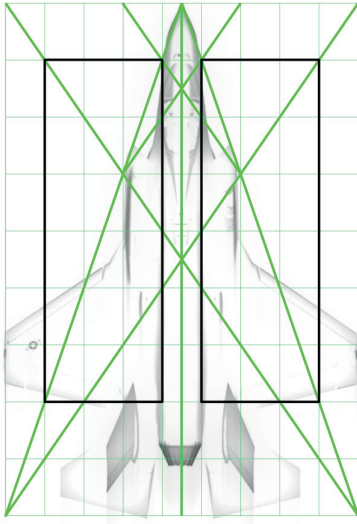


Fig. 7: A supposedly harmonious design of the F-35 Lightning II can also be seen in *Tschichold's golden canon*: Wing edges terminate perfectly with the floor of the content's frame (black). The cockpit terminates with the upper edge. The jet engine itself separates the aircraft neatly into „readable“ halves with the spine in place, strongly highlighting the delta shape.

Since the surfaces of high-tech machines are less dependent on their actual function, they can be designed to be either concealing or permeable to their operating principle: The significant inner life of modern cars and airplanes is a software that can be updated or replaced even in crucial aspects, without these changes ever being visible on the outside. The software itself runs on boards that are undifferentiated to the layman. Remaining physical *interfaces*, such as air resistance or a bumpy road, are still noticeable as the rough aspects of mech-tech aesthetics, but they are dampened in perception by the use of quieting technology, electric motors and optimized aerodynamics. The modern car as the modern plane both hide parts of their

uncomfortable physical environments from the user, while the comfort gained in this way creates possibilities for reception of new information in virtual interfaces.

If one wants to place the F-35 Lightning II in between these poles of high-tech and mech-tech aesthetics, different aspects can be found: Physical interfaces to the environment and thus remaining mech-tech aesthetics arise during the impressive take-off, in which by combustion the aircraft develops a propulsion and force, that easily exceeds the physical power of man. The interplay between thrust and movement is understood. It is mechanical. However, the fact that this movement ends in the very take-off of an object that weighs up to 30 tons,⁴⁵ is what begins to transcend any intuitive comprehensibility of mech-tech aesthetics – an effect that certainly constitutes to the fascination of flying.

Although the pilot is seated right above a noisy, heavy-duty jet engine, he perceives his surroundings mainly through a state-of-the-art augmented reality headset, that provides features from active noise reduction, to visual targeting, weapon cueing, night vision, general flight information and even a virtual view through the floor of the aircraft itself.⁴⁶ The mechanical relationships of

45 Royal Australian Air Force, F-35A specifications (2019), <https://www.airforce.gov.au/technology/f-35a-specifications>, access: April 10, 2019, 03:00pm.

46 Collins Aerospace, F-35 Gen III Helmet Mounted Display System (HMDS) (2019), <https://www.rockwellcollins.com/Products-and-Services/Defense/Avionics/Displays-and-Controls/Helmet-Mounted-Displays/F-35-Gen-III-Helmet-Mounted-Display->

the environment, especially noise, are designed out of perception in favour of strategic information. Software and interface are what become elementary to function, but not to physical form. Armament disappears for reasons of stealth and is selected inside of the F-35's body. With this, the F-35 hits the very point of high-tech products identified by Brummet, which are covering both purpose and function behind layers of surfaces.

The hierarchization of surfaces in high-tech machines can have the tendency to *stop* a viewer's gaze at the outermost of the presented surfaces. For this reason, high-tech products can seem to be of easier use, but at the same time be less approachable in their operating principles, than mech-tech products are.⁴⁷ Dirk Baecker finds the words:

*The term black box replaces the term substance and allows to bracket what can be presumed, but need not be understood.*⁴⁸

Generally, products offer their users a purpose: A good design then uses affordances to make certain intended uses and receptions more likely than others. Donald Norman's considerations of human-centered product design imply: Where mech-tech becomes high-tech, where products are no longer explaining themselves, they need a design that does it for them – they evolve for the need of an interface. Human affect in high-tech product development therefore is a tar-

geted and necessary process, to simplify cognition where appropriate. For this, information is selected onto or underneath said surfaces, designed for a simple goal of user perception: "[H]ere is potential danger, there is potential comfort. This is nice, that bad."⁴⁹

High-tech aesthetics according to Brummet⁵⁰ would thus be able to stop cognitive processing of an object at the outermost of the presented layers, by giving affordances that do not correspond to neither principle nor purpose. An aesthetic distance to an object's function is established: What is therefore potentially hiding beneath layers of high-tech in the F-35 is the fact, that it is indeed a violent *machine* of war and a very real threat to human lives – all while its design tries to sell it as an *instrument*. A mechanical *plane of war* disguising as a high-tech *fighter jet*. The F-35's initially elaborated surface language suggest, in addition to dynamism and professionalism, a threatening nature whose direction of force is rendered unrecognizable: For the fleeting observer, who is not a potential target, the F-35 can thus only represent a powerful testimony to technology that seems to be directed against nobody and everyone else. This high non-directionality is further underlined by the minimal flagging, dispassionate colouring, the impartial grey, the lack of visible weapon systems and the visual uniformity of modern fighter planes on an international level.

System.aspx, access: April 10, 2019, 03:00pm.

47 Barry Brummet, *Rhetoric of machine aesthetics*, p. 57.

48 Dirk Baecker, *4.0 oder Die Lücke, die der Rechner lässt* (Leipzig 2018), p. 182.

49 Donald A. Norman, Emotion and design: Attractive things work better. *Interactions Magazine* ix (2002), https://jnd.org/emotion_design_attractive_things_work_better/, access: April 10, 2019, 03:05pm.

50 Barry Brummet, *Rhetoric of machine aesthetics*.



Fig. 8: Norway's first F-35 lightning II in October 2015. svarsdepartementet, Kaszynski, Lockheed Martin, Testflyging av første norske F-35. (2015), <https://www.flickr.com/photos/forsvarsdepartementet/22504078631/>, access: March 17, 2021, 11:00pm.

Abstraction and a change of perspective

The disappearance of said function under surface can also be found in Italian Futurism around 1930 in the form of *Aeropittura*,⁵¹ illustrated for example by the cinematic paintings of Tullio Crali. While mostly colourful and aesthetically impressive, both the artist and his work

are however closely linked to the ideas behind and the promotion of Mussolini's fascist regime in Italy.⁵²

In his paintings, Tullio Crali tries to convey the breath-taking heights, speed and excitement of military flight and (often) aerial dogfight, through the abstraction of speed and conflict, in a geometric visual language. In the notion of futurism, he proclaims progress through high mechanization, considering the airplane "the highest among the machines, that realizes the myth of Icarus, the eternal dream of man-

51 Estorick Collection, *Futurist Skies: Italian Aeropainting*. Estorick Collection of modern Italian art (2015), <https://www.estorickcollection.com/exhibitions/futurist-skies-italian-aeropainting>, access: March 15, 2021, 06:30pm.

52 Laura Cumming, Tullio Crali: A Futurist Life Review – a Head-on Revelation. *The Guardian* (January 12, 2020), <http://www.theguardian.com/artanddesign/2020/jan/12/tullio-crali-a-futurist-life-estorick-collection-review>, access: March 15, 2021, 06:30pm.



Fig. 9: *Incuneandosi nell'abitato* (In tuffo sulla città), 1939, by Tullio Crali (Igalò, 1910 – Milano, 2000); oil on canvas, 130 x 155 cm. Mart, Museo di arte moderna e contemporanea di Trento e Rovereto.

kind".⁵³ His work *Incuneandosi nell'abitato* (Figure 9) conveys to the viewer this kind of ecstatic dynamism, taking the literal perspective of said *uber-machine*.

The painting could be described as *pleasant*, due to the artist's use of perspective, composition and colour – and in effect it is even called a *masterpiece of futurist art*.⁵⁴ Many however can and do

not know, what the painting is actually presenting: The work from 1939 does not depict any random airplane, but takes the perspective of a dive bomber in attacking flight for a city. The pilot adopts said *steep perspective* for a vertical nosedive, in order to align his path of flight with the trajectory of his bomb, to hit his target with a high degree of certainty. It is the same moment when the Jericho trumpets of Stuka bombers would be heard. It is only the knowledge about the nosedive for bombing purposes, that can add to the visual surface of the work and

53 Bob Osborn, Tullio Crali – the ultimate Futurist Aeropainter (2012), <https://web.archive.org/web/20120216062948/http://www.simultaneita.net/tulliocrali.html>, access: April 10, 2019, 03:30pm.

54 Cumming, Tullio Crali.

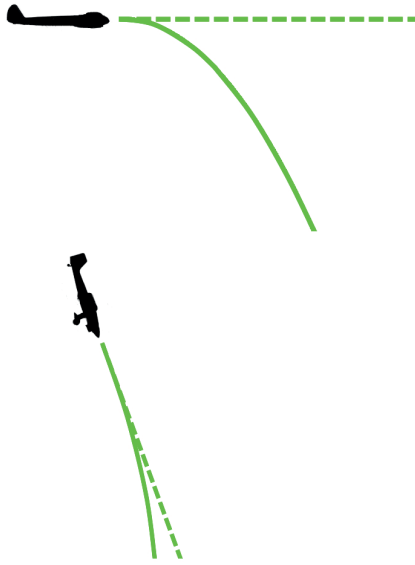


Fig. 10: A Stuka bomber is going to dive, in order to align the trajectory of his path of flight with his bomb. MLWatts, Vergleich des Bombenabwurfs im Horizontalflug und im Sturzflug (2011), <https://de.wikipedia.org/w/index.php?title=Sturzkampfflugzeug&olddid=205219671>, access: November 5, 2020, 02:05pm.

give back to it part of its dread, which then stays in stark contrasts to the purity of its geometric language – an aesthetic pattern that may also be found in the design of the F-35.

*The changing perspectives of flight constitute an absolutely new reality, one that has nothing in common with the reality traditionally constituted by earthbound perspectives.*⁵⁵

The constitution of non-earthly reality, a literally lifted perspective, the abstraction to machine, and the vibrant language in the writings and paintings of Aeropittura, were able to create aesthetic distances to the violent and messy realities of the conflict, that would arise as World War II. With its visual qualities it is therefore no coincidence, that the Aeropittura soon

finds itself as an actual tool of propaganda for 1940s fascist regimes, promoting military aspirations through abstraction, while glorifying aerial warfare: Machines are depicted, humans are not.⁵⁶

The futurists created these aesthetics facing high technologies of their time, as a response to an industrializing world becoming ever faster and increasingly incomprehensible;⁵⁷ conditions that are still prevalent today. As described in the Manifesto dell'aeropittura, modern fighter jets make use of non-earthbound perspectives, and with distinctive design patterns try to cast state-of-the-art images of technological superiority into clear-cut form, in response to accelerationist environments.

The strong silhouettes in both the geometric language of Aeropittura and the F-35 Lightning II are representative to studies by Woodward, Winter and Jenkins, on the visual depiction of British soldiers in domestic print media, which emphasize:

*[T]hese silhouettes render this particular conflict timeless; all references to the specifics of time and place are removed. [...] In the case of these photographs of conflict, the war in Afghanistan in these images becomes bloodless.*⁵⁸

56 Jonathan Jones, Birds of prey. *The Guardian* (January 5, 2005), <https://www.theguardian.com/culture/2005/jan/05/1>, access: April 10, 2019, 03:40pm.

57 Jan Drees, Das akzelerationistische Manifest. *Deutschlandfunk* (April 26, 2015), https://www.deutschlandfunk.de/philosophie-das-akzelerationistische-manifest.1184.de.html?dram:article_id=314626, access: April 10, 2019, 03:40pm.

58 Rachel Woodward, Trish Winter, and K. Neil Jenkins, Heroic anxieties: the figure of the British soldier in contemporary print media. *Journal of War & Culture Studies* 2/2 (2009), p. 211–23.

55 Estorick Collection, Futurist Skies: Italian Aeropainting.

Military use of aesthetics

If any aesthetic affect in the military realm is to be called a strategy, goals and purposes need to be clarified. In particular, a document of the RAND Corporation can be cited, which in 1996 produces recommendations for the future of U.S. air operations on psychological grounds.⁵⁹

The RAND Corporation itself is a U.S. think-tank that was founded in 1948 out of the Douglas Aircraft Company for issues of security policy.⁶⁰ As a FFRDC it provides the U.S. Air Force with strategic advice on policy, employment, combat readiness and development of its aerospace forces.⁶¹

After the U.S. air wars in World War II (1941–1945), Korea (1950–1953), Vietnam (1965–1972) and the Persian Gulf (1991), recommendations are made to the U.S. Air Force based on interviews with prisoners of war. These recommendations are aimed at psychological effects, driven by the idea, to keep conflicts short, or to prevent them in the first place, by ways of technological intimidation – also during times of peace.

For this reason, in addition to recommendations on rhythm and targeting of U.S. air strikes, the technological superi-

ority of U.S. forces is given high emphasis: *[M]any Iraqi officers and enlisted personnel suffered from low morale even before the start of the Coalition air campaign. One reason for their low morale was the widespread awareness that U.S. aircraft, tanks, and other weapons were far more capable than their own obsolete military weapons. The Iraqis believed that the technological superiority of the U.S. weapons foreordained Iraq's defeat in any conflict. The Coalition air campaign subsequently strongly reinforced the Iraqi view that resistance was futile.*⁶² *Begin psychological conditioning in peacetime. The Air Force and other U.S. military services have an interest in advertising their capabilities to would-be aggressors. For the Air Forces, much of this advertising will be a natural by-product of fire-power demonstrations, air shows, and peacetime training and deployment exercises. These and other opportunities should be used where appropriate to demonstrate the superior capabilities of technologically advanced U.S. aircraft and weapon systems.*⁶³

From this point of view, the development of combat aircraft like the F-35 Lightning II makes considerable sense, as they can communicate technological superiority already by design, and are not limited to costly demonstrations, manoeuvres or even most costly, warfare itself.

The F-35 is thus creating a trust into its function by design: It will work superiorly when necessary and hide its promise of violence when in periphery. This trust in design must however be questioned, in so far as every high-tech design is scruti-

59 Stephen T. Hosmer, *Psychological Effects of U.S. Air Operations in Four Wars, 1941–1991: Lessons for U.S. Commanders* (Santa Monica, CA 1996).

60 Alex Abella, *Soldiers of Reason: The RAND Corporation and the Rise of the American Empire* (Boston 2009)

61 Hosmer, *Psychological Effects of U.S. Air Operations in Four Wars*, p. 3.

62 *Ibid.*, p. 204.

63 *Ibid.*, p. 205.

nized under the assumption of “only pretending to have a surface under which other, hidden surfaces serve completely different interests and functions.”⁶⁴ It is this conflict between the promises of and mistrust in design, that drives the ongoing debate about the F-35 as a breakdown jet versus wonder weapon: The question of whether the F-35 can fulfil in function what is communicated by surface.

Accordingly, the fighter jet (better: *war plane*) is still seen at air shows to refute any possible suspicion of false design promises. In 2019, the F-35 A Heritage Flight Team under Captain Andrew Olson toured USA and Canada with 17 air shows. He explains:

*This show is going to solidify the F-35 in its rightful place, just [as] the absolute, cutting-edge stealth fighter jet [that’s] here and it’s ready and so capable.*⁶⁵

Deliberately or not, the advice of the RAND Corporation on how to communicate technological superiority is here implemented in the medium of air shows. Then lastly, the RAND Corporation advises for the development of explicitly *spectacular* weapons:

*In preparing for future conflict, the Air Force should seek to develop and acquire sensors and weapons systems that will magnify the potential enemy’s perception of American air prowess.*⁶⁶

64 Dirk Baecker, *4.0 oder Die Lücke, die der Rechner lässt*, p. 256.

65 Oriana Pawlyk, F-35 Demo Team Pilot to Debut All-New Moves for 2019 Show Season (2019), <https://www.military.com/dodbuzz/2019/03/11/f-35-demo-team-pilot-debut-all-new-moves-2019-show-season.html>, access: April 10, 2019, 04:10pm.

66 Hosmer, *Psychological Effects of U.S. Air Operations in Four Wars*, p. 199.

Closing

The strategies and products described in here attempt to affect their opponents by design. The F-35 Lightning II is a manifestation of this aesthetic military thinking, practicing a form of economical high-tech intimidation. Whether deliberately designed or not, the F-35 is a mega project, that favours existing U.S. policy not limited to but also by the use of aesthetics. Its affect can be examined in two directions:

In the face of an enemy, its design makes it seem an intelligent and precise threat; however with the double-edged question of how much functional fulfilment can actually lie beneath its high-tech surfaces. This ambiguity can either reinforce the feeling of awe to the fighter plane or invite to justified mistrust, to the suspicion of a *high-tech bluff*.

In the second direction, high-tech intimidation can be viewed in relation to those who are not directly involved and who do not have to fear an attack by a stealth aircraft on their person: The F-35 looks professional, clean and orderly. The aesthetic distance to both execution and threat of violence discussed in the *Aeropittura* comes into effect – for reasons of flight, the shift of perspective, the high degree of displayed power (*Shock*) and the concealing qualities of high-tech (*Awe*): Military bravado is clearly aimed to strike a balance, with civil insouciance.

The question of a goal-driven surface design of the F-35 Lightning II through the hands of any military strategist, can

not be answered definitely. The results of this work, however, suggest a common interest of all the engineers, politicians and entrepreneurs involved, to mark the supposed superiority of their product with a fit design, that serves crucial and distinct functions to each of the public, political and military sphere. High-tech intimidation then, seems to be a threat only to those, who are in need to pay attention, while remaining yet another shiny surface to the rest; leading to a very possible answer to Baecker, as he states:

*The question of the next society is, what threats are capable of ensuring that construction of power, without which politics in the sense of establishing order of whatever kind, is not possible.*⁶⁷

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⁶⁷ Dirk Baecker, *4.0 oder Die Lücke, die der Rechner lässt*, p. 100.

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